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Welcome to the Learning System for Automation and Technology

Your partner for vocational and continuing training

Learning, knowledge and education are the big themes of this new century. Festo Didactic brings over 35 years' experience to the table when developing solutions for fast learning and successful retention for the entire range of automation and technology.
This expertise and experience puts us in a key position in this market of the future. Demand for training will continue to grow rapidly. And that's why we have set ourselves the goal of making learning ever more efficient.
A great challenge for us. A great partner for you.

One-stop shopping

Today the Learning System for Automation is more comprehensive and up-to-date than ever and includes all current automation topics in its product range:
– Pneumatics
– Electropneumatics
– Hydraulics
– Electrohydraulics
– Electronics
– Sensors
– Robotics
– CNC technology
– PLC and fieldbus technology
– Manufacturing technology and process engineering
– Mechatronics

From basics to a complete training center

From basic training packages and technology-specific courses right through to planning, control and handling of complex networked CIM systems and complete, fully furnished learning centres – we have created a world of learning for you which is tailored to your personal needs for efficient study and guaranteed learning success.

At your side, worldwide

We speak your language! And we are just around the corner – in more than 100 countries around the world.
We will gladly visit you at your office or home – whether you want to book courses or buy software, books or other products. Or perhaps you want to use the extensive range of online services – we're just a mouseclick away at www. festo.com/didactic – the Internet marketplace for education and training.

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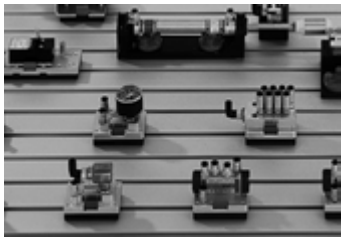
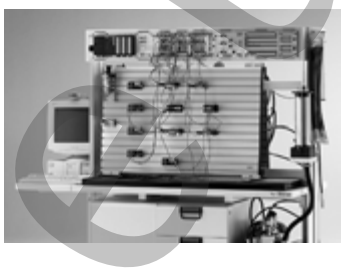
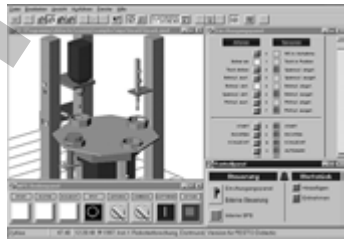
Welcome to the Learning System for Automation and Technology

Contents







Welcome

What's new ____ 4

Training Packages

Technology-oriented basis for your learning success

Overview ____ 12

Pneumatics

Overview ____ 15
Equipment sets ____ 16
Components ____ 29

Hydraulics

Overview ____ 53
Equipment sets ____ 54
Transparent models ____ 64
Components ____ 71

Sensors

Overview ____ 87
Equipment sets ____ 88
Components ____ 91

Electronics/PLC

Overview ____ 107
Controllers ____ 111
Process models ____ 118
Fieldbus ____ 120
Components ____ 121

Accessories

and optional components ____ 130

Workstation systems

Learnline and Economyline – The concept of the modular training environment for basic and further training

Overview ____ 150

Learnline

Overview ____ 151
Complete systems ____ 157
Basic units ____ 160
Components and accessories ____ 162

Economyline

Overview ____ 169
Stationary workstations ____ 170
Mobile workstations ____ 171
Accessories ____ 174

Virtual World of Learning ____ 178

Software and Courseware

Multimedia learning and fun: Edutainment®

Overview ____ 180

Software

Learning programs ____ 182
Design and simulation ____ 186
Programming and visualization ____ 192

Courseware

Pneumatics ____ 200
Hydraulics ____ 210
Sensors ____ 220
Electronics/PLC ____ 222
Mechatronics/ handling technology ____ 229
Process automation ____ 232
Additional accessories ____ 233

pneuaire

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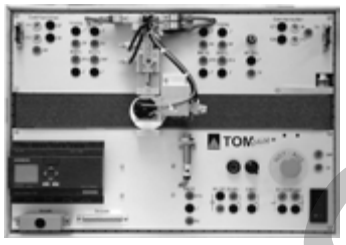
Welcome to the Learning System for Automation and Technology

Contents

Futurion®

The interactive desktop learning system

Training concept _____ 236
Equipment _____ 238
Courses _____ 240
Accessories _____ 252



TOMcase

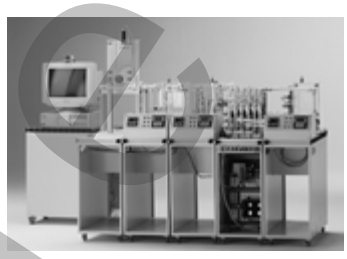
An introduction to automation

Mechatronics in a case _____ 254

MPS® and FMS/Integrated systems

The modular mechatronic system for training in industrial manufacturing processes

See catalogue volume 2.



Process Control System

Measuring and control of processes: Practice-oriented training in continuous processes in industrial systems

See catalogue volume 2.

Index

Alphabetical _____ 257
Numerical _____ 265

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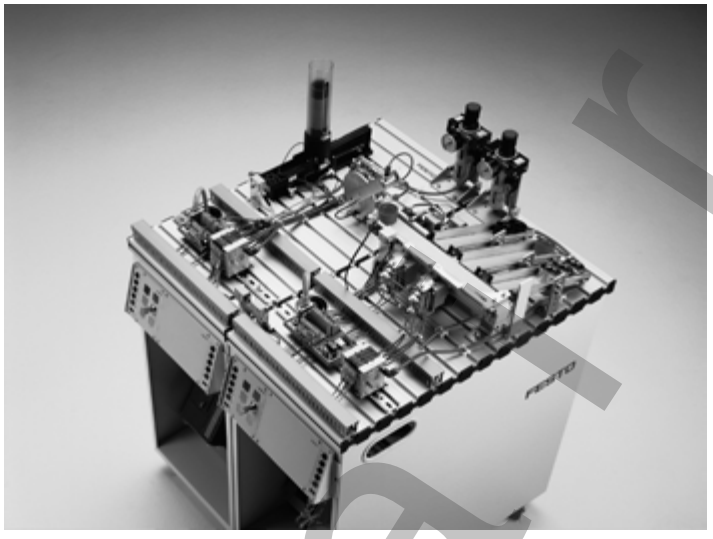
Welcome to the Learning System for Automation and Technology
What's new

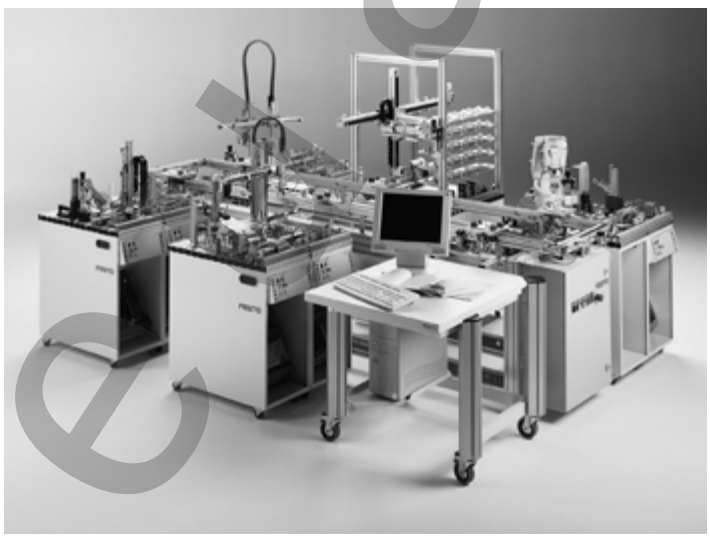
New products in Festo quality.

The Learning system continues to develop. Here is an overview of new products in 2002.



The new MPS®

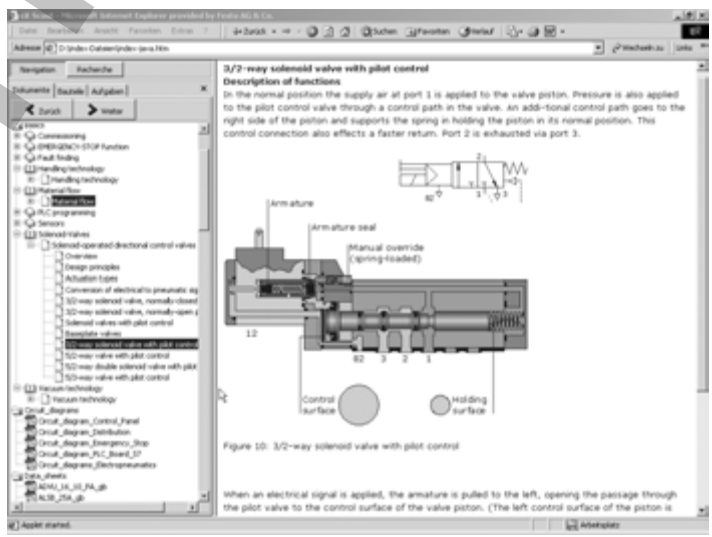
MPS® – the modular project kit. For highlights and more information, please see catalogue volume 2, chapter MPS®.



FMS 50

The low-cost training environment for flexible manufacturing and integrated systems.

See catalogue volume 2, chapter FMS/Integrated Systems.



Mechatronics Assistant

The new innovative multimedia courseware on CD-ROM.

Check it out in chapter Courseware and in catalogue volume 2, chapter MPS®.

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24-month Festo Didactic warranty

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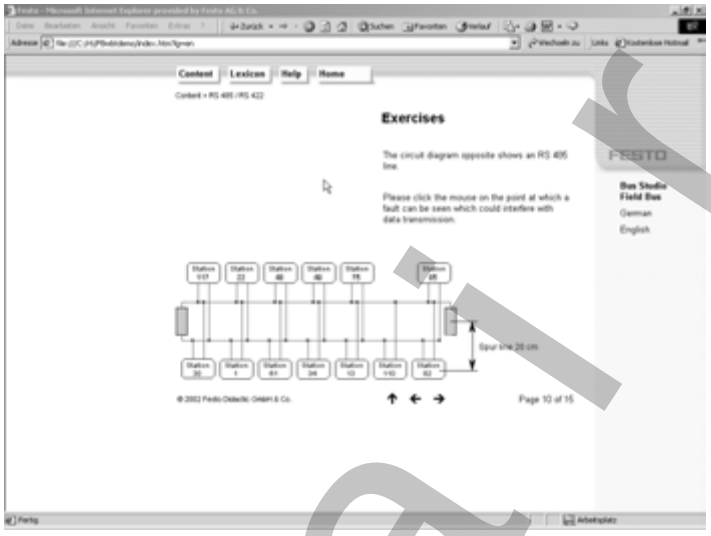
Welcome to the Learning System for Automation and Technology

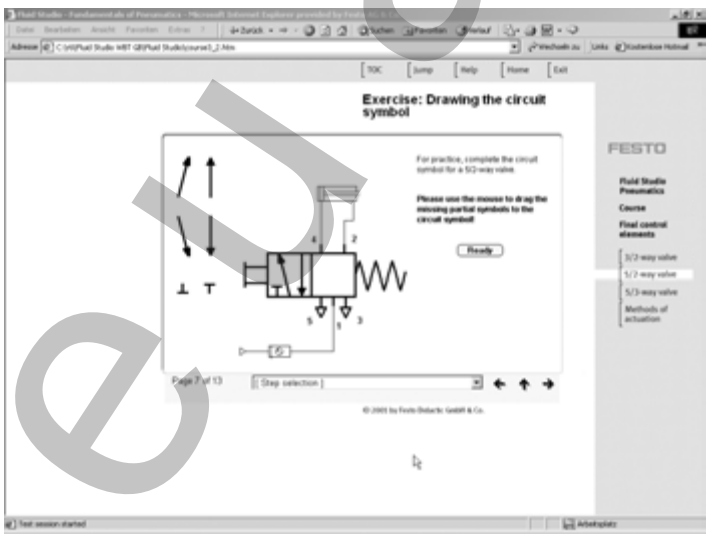
What's new



New learning programs on CD-ROM. Now also available as Web-based training for use in intranets and E-Learning platforms.

– Bus Studio WBT: Fundamentals of fieldbus technology
– Fluid Studio® WBT: Fundamentals of Pneumatics and Hydraulics
– The Festo Dictionary of Automation

Now in the Software chapter.



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Welcome to the Learning System for Automation and Technology
Service

We have defined "value add" for you

Festo Didactic is your partner in vocational and continuing training. We measure our success by your satisfaction – which is why we are constantly striving to optimize our products and services to meet your needs.

The Internet marketplace for schools and vocational training: www.festo.com/didactic.

All you need is access to the Internet and a web browser to have a look around, order products or to access our extensive range of services. We are at your service around the clock.

Create your customized three-dimensional training lab.

The software for this is now available free on the Demo CD "Interactive Guide to Festo Didactic" – or you can download it at www.festo.com/didactic.

At your side

We speak your language! And we are just around the corner – in more than 100 countries around the world.

Swap shop

If a part is faulty after years of service – and you need an urgent replacement: No problem. Our replacement service offers to swap your part within a few days – for a moderate charge. Ask about it!

24-month warranty

Our quality pays off. That's why all our products – with the exception of parts subject to wear – come with a 24-month warranty.

And we'll be there when you need us – even years later.

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Welcome to the Learning System for Automation and Technology

Quality

Our quality is prized

The didactic quality of training concepts and product quality are integral elements of innovation. As the leading supplier of automation training worldwide we offer you guaranteed quality.

The training hardware and study media are tailored to the latest didactic requirements and findings.

The awards speak for themselves:
- FluidSIM®:
  Worlddidac Award 1996
  digita award 1996
- MPS®:
  Worlddidac Award 1998
- Futurion®:
  Worlddidac Award 2000
  digita award 2000
- COSIMIR® Educational:
  Nominated for the digita award 2001

However, the best training concepts are of little value if the products do not meet the demands of everyday practice.

Here too, we guarantee 100 % quality:
- Festo Didactic's training systems and components meet the requirements of all the relevant standards and guidelines such as DIN/ISO and VDE
- Only industrial components are employed
- Festo Didactic is DIN EN ISO 9001 certified
- Our training and project competence was awarded the title SIMATIC Solution Provider by Siemens
- Our customers' opinions are important to us. That's why we regularly commission customer surveys by the economic research institute NFO Infratest.

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Welcome to the Learning System for Automation and Technology
Training and Consulting

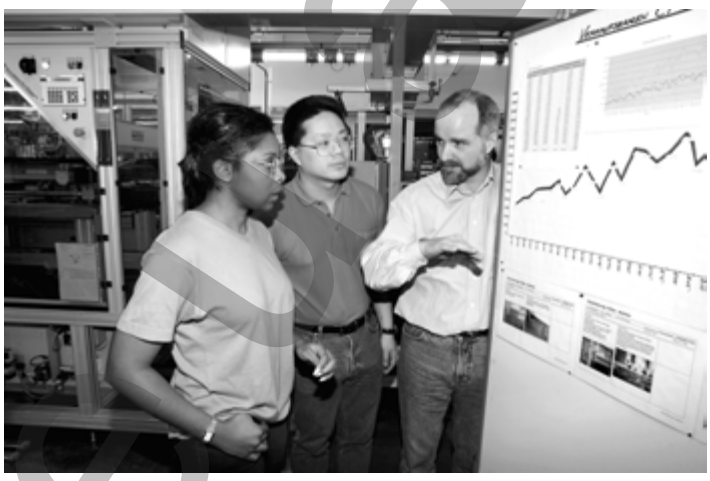
Practice-oriented courses

With over 3500 courses annually in more than 26 languages, Festo Didactic provides practice-oriented training like no other company. Experienced instructors cover all topics and trends in the fields of automation technology.

In addition to conventional courses in Festo's own high-tech training centres, a wide range of in-house courses, industry-specific courses and customer-specific qualification projects are available.
You can find our current course program for your country of choice at our website: www.festo.com/didactic.
Or ask for our detailed course plan.

Customized company courses
Consulting, analysis, delivery

We work with you to plan courses customized to your needs and deliver them on your premises. Joint analysis of requirements can be a very useful initial step.



The success of courses can be measured. One of the key criteria for course quality is rapid implementation of course content in day-to-day work:
– Fewer machine failures
– Faster repairs
– Higher system availability
– Higher quality of repairs
– Better cooperation between departments
– Greater number of fault prevention measures implemented

Shop-floor innovation
Lean production

Whether TPM, TQM, kaizen, kanban, group work or lean production – in recent years there have been plenty of approaches to making production processes more efficient.
But unfortunately, what seems so clear in theory often does not work properly in practice – because the transition from one type of production organization to another is also a change process.

For this reason, Festo Shop-Floor Innovation adopts a systematic approach to change management. The core elements are establishing a corporate culture of change and enabling employees to develop the most suitable concepts themselves.

preview

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Welcome to the Learning System for Automation and Technology
Training and Consulting

Personal consulting

Courses are not always the best or most cost-effective solution. Other types of learning such as distance learning, computer-based training or coaching often offer greater or faster success. This can be determined by joint analysis of requirements. That's what we're here for.

Self-study using textbooks, software and e-learning.

Study in the classroom with training packages and practical models such as MPS®, Process Control System and Futurion®.

Learning on the job or near the job with the help of coaching or individual training at the workplace.

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Training packages

Pneumatics
Hydraulics
Sensors
Electronics/PLC
Accessories

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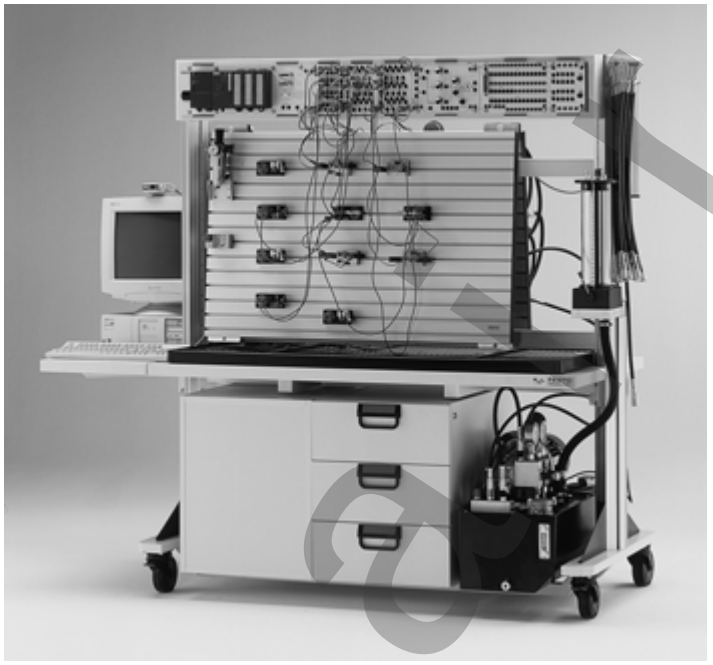
Training packages
Learning with innovative technology

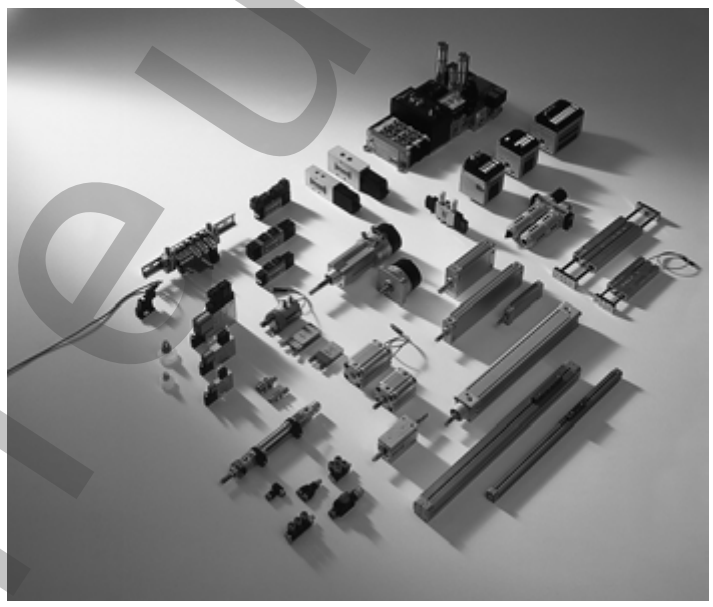
The modular training system with many practical details

The universal aluminium profile plate used in conjunction with ergonomically designed workstation systems provide the perfect training environment for vocational and continuing training in automation technology:
– Pneumatics
– Hydraulics
– Sensors
– Electronics/PLC



One-stop shopping – Everything coordinated down to the very last detail

– Start today at low cost and expand tomorrow as and when you need.
– The universal profile plate is the basis for all function-oriented training packages.
– It is a mounting system for all areas of application.
– The contents of each training package are geared to those of the others – from basic training right through to specialized training.



The closest thing to industrial reality.

Learning with innovative technology. Practice-oriented training and further training with industrial components provides you with the necessary confidence for your daily work.

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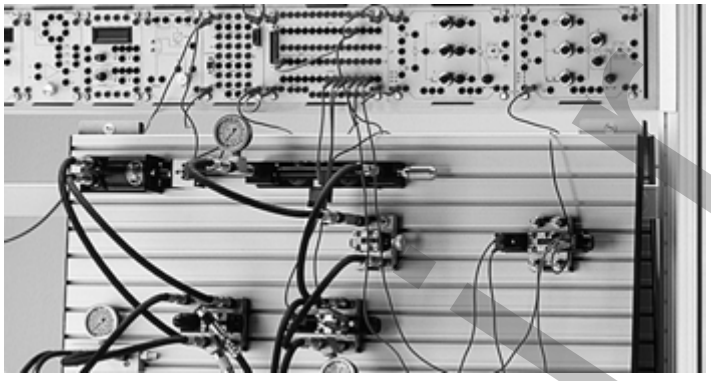
Training packages

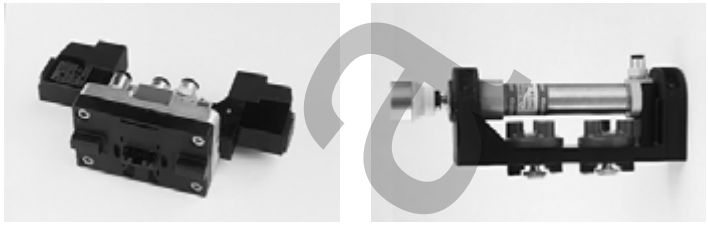
Practical functions – down to the last detail

Ergonomic and space-saving



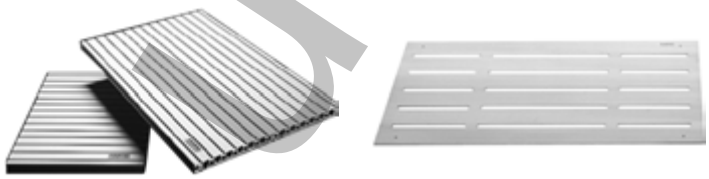
All pneumatic, hydraulic and electrical connections are located on the tops of components.

The mounting system:
Plug it – clamp it – done



Using the patented Quick-Fix mounting system you can mount components easily, safely and with little effort on the profile plate.

Mounting plates as required



Components are mounted quickly and clearly on the universal profile plate. Nearly all components can also be mounted on the slotted mounting plate.

The perfect storage system

The drawer insert serves as an organizer for quick and orderly storage of individual parts in the workstation drawer units – included in the scope of delivery of the training packages.

Training aids for every training package

Software, CBTs, textbooks, collections of exercises and videos – each produced in many languages – create a pleasant learning environment for every training package.

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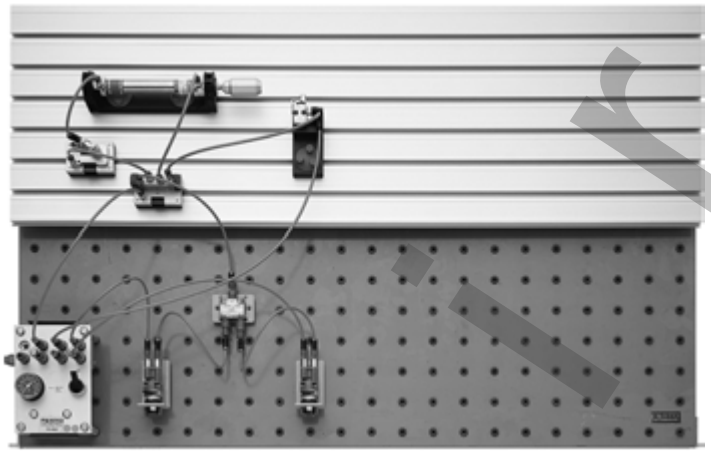
Training packages
Moving from blue to silver

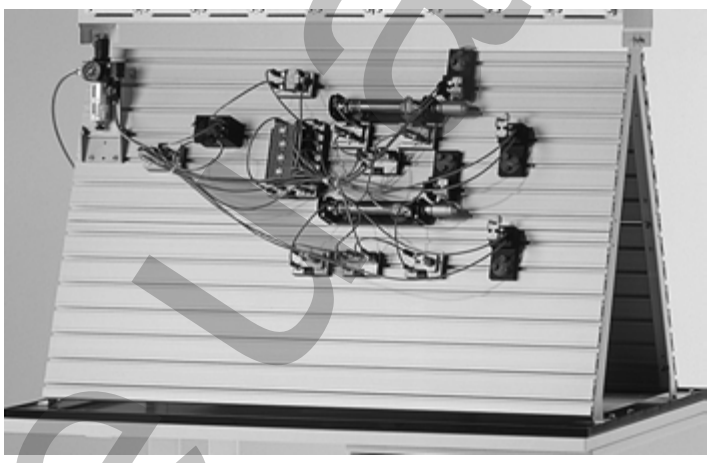
Option 1:
Gradual transition to the aluminium profile plate.

You supplement your blue plug-in board by a “half-size” profile plate (350 mm x 1100 mm). It is simply connected to the plug-in board with the plug-in feet provided.
To ensure that you are prepared for upcoming upgrades, start using the 4-mm hose straight away and use cost-effective adapters for connections to existing cylinders and valves.



The new drives work with greater forces. The sensors can be positioned to the millimeter. And the horizontal plate allows setup of a third dimension – for example for control of MPS® modules.
You can continue to use your “blue” components. And you can purchase spare parts from the P/H2000 systems without compatibility problems.

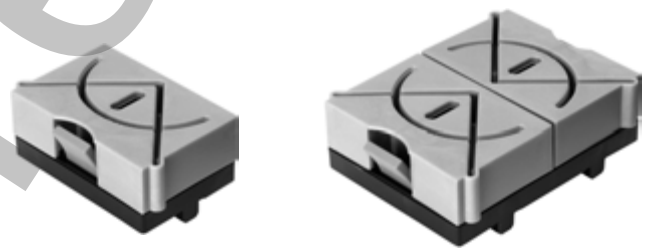
You can then complete the change by purchasing a second “half-size” profile plate (350 x 1100 mm). The two plates can either be connected to plug-in boards or to an Economyline workplace, which is equipped with such half-size profile plates as standard.



The QuickFix system allows quick and safe setup of all exercises.
Your other “workplaces” are ensured long-term service by spare parts that become available.

Option 2:
Secure existing components on the aluminium profile plate with the universal adapter.

Suitable for most pneumatic and electropneumatic components. Some components require special mounting adapters (see Accessories chapter).



You continue to use existing components – and benefit from the new mounting system and the Festo Didactic workplace systems.
In two sizes – fitting all Festo and third-party components. Including securing screws.

Ordering data:

Aluminium profile plate	350 x 1100 mm	Order no. 162 360
Mounting kit for mounting the profile plate onto the plug-in board		Order no. 532 200
Tube adapter for externally calibrated tubes, from 6 to 4 mm Ø, disconnectable		
Minimum quantity	10 units	Order no. 153 327
Tube adapter for internally calibrated tubes, from 3 to 4 mm Ø, non-disconnectable		
Minimum quantity	10 units	Order no. 004 499
Universal adapter, small	75 x 50 x 30 mm	Order no. 195 224
Universal adapter, large	75 x 100 x 30 mm	Order no. 195 225

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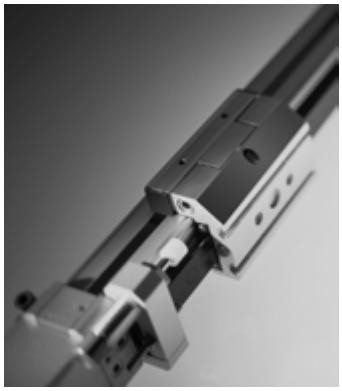
Training packages Pneumatics
Overview

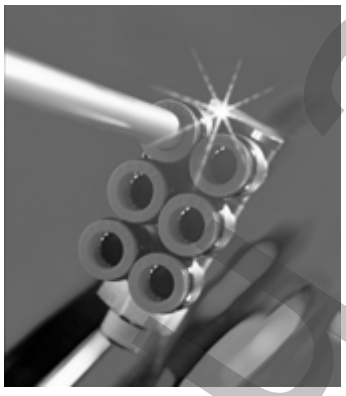
Equipment sets with Festo-quality components

Innovative technology combined with long service life for practice-oriented training. For all areas of modern pneumatics.
Naturally featuring the patented Quick-Fix mounting system for quick and secure mounting of components on the profile plate.



State-of-the-art connector technology

Quick Star quick push-pull connectors offer a number of benefits:
– Plug it – done
– Flexible assembly – all connectors can be rotated 360° around the threaded pin
– Absolutely safe and airtight – with seals of NBR plastic
– Multiple applications – thread with self-sealing Teflon coating



Standard tubing from Festo

– Now in 6 different colors for greater clarity in training
– Particularly flexible and kink-resistant

The perfect learning environment

Software, CBT, textbooks, collections of exercises and videos, each produced in many languages, create a pleasant learning environment for every training package.

Pneumatics, Basic level TP 101

Partial equipment set Pneumatics, Basic level

Pneumatics, Advanced level TP 102

BIBB Pneumatics

Supplementary equipment set TP 101 to 201

Electropneumatics, Basic level TP 201

Electropneumatics, Advanced level TP 202

BIBB Electropneumatics

Control pneumatics, TP 111

PneuPos, pneumatic positioning

SoftStop, controlled end-position cushioning

Components

preview

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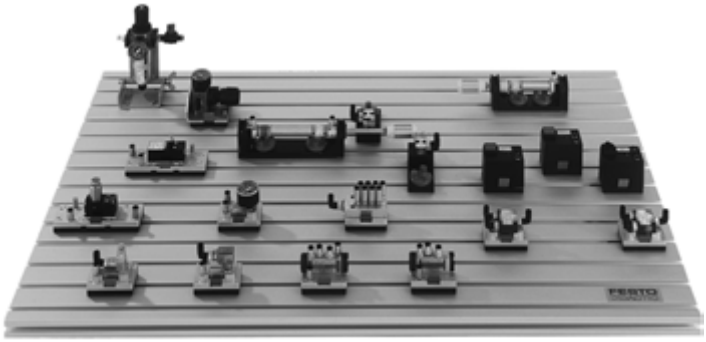
Training packages Pneumatics
Equipment sets

Pneumatics equipment set, Basic level TP 101



Training aims:
- Physical fundamentals
- Fundamentals and terminology of control technology: Control sequence, signal flow circuit planning and display
- Pneumatic power components for linear motion
- Pneumatic directional control valves
- Pneumatic pressure, non-return and flow control valves
- Logic elements and diagrams
- Simple controls
- Safety requirements

Recommended study media:
- Self-study program Fluid Studio® Pneumatics
- Design and simulation program FluidSIM® Pneumatics
- Textbook Pneumatics, Basic level
- Workbook Pneumatics, Basic level
- Transparency set Pneumatics, Basic level
- Video Pneumatics, Basic level

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Compressor (Order no. 091 030)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Plastic tubing, 10 m, PUN 4 x 0.75	2	151 496
3/2-way valve with pushbutton actuator, normally closed	3	152 860
3/2-way valve with pushbutton actuator, normally open	1	152 861
5/2-way valve with selector switch	1	152 862
Pressure gauge	2	152 865
3/2-way roller lever valve, normally closed	3	152 866
3/2-way roller lever valve with idle return, normally closed	1	152 867
5/2-way pneumatic valve, pneumatically actuated, one side	1	152 872
5/2-way double pilot valve, pneumatically actuated, both sides	3	152 873
Shuttle valve (OR)	1	152 875
Dual-pressure valve (AND)	1	152 876
Time-delay valve, normally closed	1	152 879
Quick-exhaust valve	1	152 880
One-way flow control valve	2	152 881
Pressure sequence valve	1	152 884
Single-acting cylinder	1	152 887
Double-acting cylinder	2	152 888
Start-up valve with filter control valve, 40 µm	1	152 894
Pressure control valve with pressure gauge	1	152 895
Manifold	1	152 896
Connectors	1	152 898
Quick push-pull distributor	10	153 128
Equipment tray*	1	119 397
Complete equipment set		**080 240**

(Technical data and description: Pneumatics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

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Partial equipment sets Pneumatics, Basic level TP 101

In order to allow users a gradual start, the Pneumatics Basic level TP 101 equipment set (Order no. 080 240) has been divided into 4 modules. Each module is accommodated in a Systainer and equipped with a small 350 x 250 mm profile plate. The 4 rubber feet allow the profile plate to be used on any Tabletop. All 4 partial equipment sets together are equivalent to the TP 101 equipment set. The 4 small profile plates can be connected using parts supplied to create a 700 x 500 mm profile plate, providing space to do the more extensive TP 101 tasks.

Module 1:
Single-acting cylinder and valves

These modules can be used to teach the control and function of single-acting cylinders and general fundamentals of pneumatics. They cover tasks 1 to 3 in the TP 101 workbook (see the Teachware chapter).

Components	Quantity	Order no.
Plastic tubing, 10 m, PUN 4 x 0.75	1	151 496
3/2-way valve with pushbutton actuator, normally closed	1	152 860
3/2-way valve with pushbutton actuator, normally open	1	152 861
Pressure gauge	2	152 865
Quick-exhaust valve	1	152 880
One-way flow control valve	1	152 881
Single-acting cylinder	1	152 887
Start-up valve with filter control valve, 40 µm	1	152 894
Manifold	1	152 896
Aluminium profile plate	1	159 333
Systainer	1	526 715
Complete partial equipment set		**192 198**

(Technical data and description: Pneumatics chapter – Components)

Module 2:
Double-acting cylinders and valves

Modules 1 und 2 allow teaching of the control and function of double-acting cylinders. This covers tasks 4 and 5 of the TP 101 workbook.

Components	Quantity	Order no.
3/2-way valve with pushbutton actuator, normally closed	1	152 860
5/2-way valve with selector switch	1	152 862
5/2-way pneumatic valve, pneumatically actuated, one side	1	152 872
Dual-pressure valve (AND)	1	152 876
One-way flow control valve	1	152 881
Double-acting cylinder	1	152 888
Quick push-pull distributor	10	153 128
Aluminium profile plate	1	159 333
Connector	1	395 128
Systainer	1	526 715
Complete partial equipment set		**192 199**

(Technical data and description: Pneumatics chapter – Components)

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Module 3:
Advanced level with logic components

Modules 1, 2 and 3 allow teaching logical associations, sequences under time control and the implementation of operating modes for the control of cylinders. This covers tasks 6 to 9 of the TP 101 workbook.

Components	Quantity	Order no.
3/2-way roller lever valve, normally closed	2	152 866
5/2-way double pilot valve, pneumatically actuated, both sides	1	152 873
Shuttle valve (OR)	1	152 875
Time-delay valve, normally closed	1	152 879
Pressure sequence valve	1	152 884
Pressure control valve with pressure gauge	1	152 895
Aluminium profile plate	1	159 333
Connector	1	395 128
Systainer	1	526 715
Complete partial equipment set		**192 200**

(Technical data and description: Pneumatics chapter – Components)

Module 4:
Supplement to complete TP 101

Module 4 supplies the missing components to make up the complete TP 101 equipment set. This allows tasks 10 to 20 of the TP 101 workbook to be carried out.

Components	Quantity	Order no.
3/2-way roller lever valve, normally closed	1	152 866
3/2-way roller lever valve with idle return, normally closed	1	152 867
5/2-way double pilot valve, pneumatically actuated, both sides	2	152 873
Double-acting cylinder	1	152 888
Aluminium profile plate	1	159 333
Connector	1	395 128
Systainer	1	526 715
Complete partial equipment set		**192 201**

(Technical data and description: Pneumatics chapter – Components)

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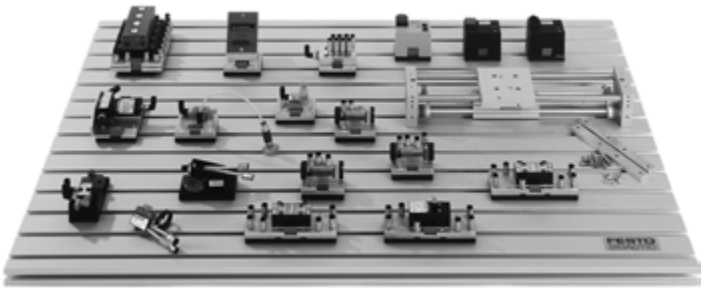
Pneumatics equipment set, Advanced level TP 102



Training aims:
- Function and structure of pneumatic elements
- Controls with start-up and installation requirements (automatic/manual, inching operation, stop at end of cycle)
- Control with vacuum elements
- Position-scheduled control /process-controlled sequencing
- Programmed control with stepper modules
- Programmed control with a sequencer
- Troubleshooting large pneumatic installations
- Controls with safety requirements (EMERGENCY ON/OFF override)

Recommended study media:
- Self-study program Fluid Studio® Pneumatics
- Design and simulation program FluidSIM® Pneumatics
- Textbook Fundamentals of pneumatic control technology
- Workbook Pneumatics, Advanced level

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Compressor (Order no. 091 030)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Adapter for spindle drive	1	150 519
Plastic tubing, 10 m, PUN 4 x 0.75	2	151 496
3/2-way valve with pushbutton actuator, normally closed	2	152 860
3/2-way valve with selector switch, normally closed	1	152 863
3/2-way valve with mushroom-head emergency button (red), normally closed	1	152 864
3/2-way roller lever valve, normally closed	1	152 866
Back-pressure valve	1	152 868
Pneumatic proximity switch	3	152 870
3/2-way pneumatic valve, pneumatically actuated, one side, convertible	2	152 871
5/2-way pneumatic valve, pneumatically actuated, one side	2	152 872
5/2-way double pilot valve, pneumatically actuated, both sides	3	152 873
Pneumatic preset counter	1	152 877
Time-delay valve, neutral open	1	152 878
One-way flow control valve	2	152 881
Shuttle valve, three-fold (OR)	2	152 882
Dual-pressure valve (AND)	2	152 883
Stepper module expansion	1	152 885
Stepper module	1	152 886
Linear drive, pneumatic	1	152 890
Vacuum nozzle/suction cup	1	152 891
Adjustable vacuum control	1	152 892
Connectors	1	152 898
Quick push-pull distributor	20	153 128
Equipment tray*	1	120 763
Complete equipment set		**080 241**

(Technical data and description: Pneumatics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

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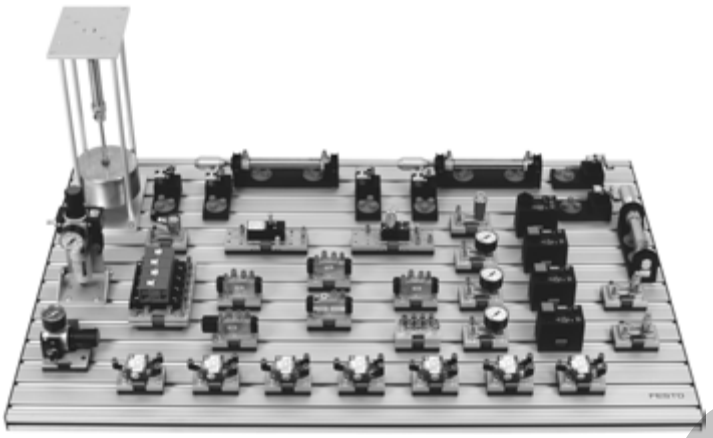
Training packages Pneumatics
Equipment sets

BIBB Pneumatics equipment set



Training aims:
- Physical fundamentals
- Fundamentals and terminology of control technology: Control loop system, signal flow, circuit structure and circuit diagrams
- Pneumatic directional controls
- Pneumatic pressure, non-return, flow control valves
- Logic devices, logic diagram
- Techniques of basic control
- Safety requirements
- Function and structure of pneumatic components
- Controls with start-up and installation requirements (automatic/manual, inching-operation, stop at end of cycle)
- Programmed control with stepper modules
- Programmed control with a sequencer
- Troubleshooting in large pneumatic controls

The selection of components complies with BIBB requirements, status January 2000.

Recommended study media:
- Self-study program Fluid Studio® Pneumatics
- Design and simulation program FluidSIM® Pneumatics
- BIBB Pneumatics course

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Compressor (Order no. 091 030)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Plastic tubing, 10 m, PUN 4 x 0.75	2	151 496
3/2-way valve with pushbutton actuator, normally closed	2	152 860
3/2-way valve with pushbutton, normally closed	1	152 861
5/2-way valve with selector switch	1	152 862
Pressure gauge	3	152 865
3/2-way roller lever valve, normally closed	4	152 866
3/2-way roller lever valve with idle return, normally closed	2	152 867
3/2-way pneumatic valve, pressure actuated, one side	1	152 871
5/2-way double pilot valve, pressure actuated, both sides	3	152 873
5/3-way pneumatic valve, pressure actuated, both sides, neutral closed	1	152 874
Shuttle valve (OR)	2	152 875
Dual-pressure valve (AND)	5	152 876
Time-delay valve, normally closed	1	152 879
Quick-exhaust valve	1	152 880
One-way flow control valve	2	152 881
Pressure sequence valve	1	152 884
Stepper module	1	152 886
Single-acting cylinder	1	152 887
Double-acting cylinder	2	152 888
Tractive/braking load	1	152 889
Optical display (red)	1	152 893
Start-up valve with filter control valve, 40 µm	1	152 894
Pressure control valve with pressure gauge	1	152 895
Manifold	1	152 896
Connectors	1	152 898
Quick push-pull distributor	10	153 128
Equipment tray 1*	1	119 398
Equipment tray 2*	1	119 399
Complete equipment set		**080 242**

(Technical data and description: Pneumatics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

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Supplementary equipment set from Pneumatics, Basic level TP 101 to Electropneumatics, Basic level TP 201

Supplements the Pneumatics, Basic level TP 101 equipment set to form a complete Electropneumatics, Basic level TP 201 equipment set.
For recommended training aids and accessories: see TP 201.

Components	Quantity	Order no.
Relay, three-fold**	1	162 241
Signal input, electrical**	1	162 242
Indicator unit and distributor, electrical**	2	162 244
Proximity switch, electronic, with cylinder attachment	2	167 060
3/2-way solenoid valve with LED, normally closed	1	167 073
5/2-way solenoid valve with LED	2	167 074
5/2-way double solenoid valve with LED	1	167 076
Pneumatic-electrical converter	1	177 459
Limit switch, electrical, left-actuated	1	183 322
Limit switch, electrical, right-actuated	1	183 345
Equipment tray*	1	120 793
Complete supplementary equipment set		**167 099**

(Technical data and description: Pneumatics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

** Four plug-in adapters are required for securing components to the profile plate (Order no. 323 571), see Accessories .

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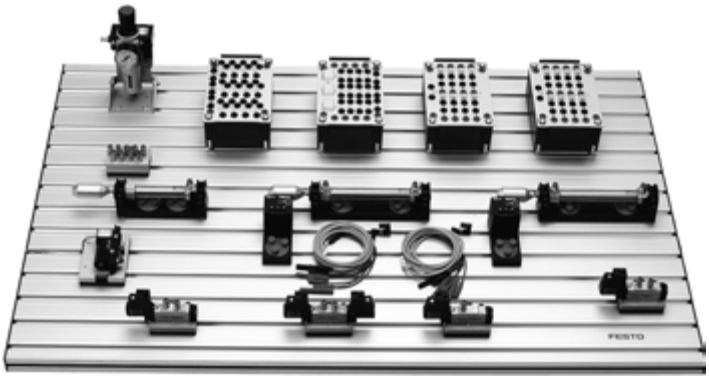
Training packages Pneumatics
Equipment sets

Electropneumatics equipment set, Basic level TP 201



Training aims:
- Physical fundamentals of electricity and pneumatics
- Function and use of electropneumatic devices
- Display of motion sequences and switch states
- Set-up of controls with relays
- Electrical self-latching switches
- Using a magnetic proximity switch
- Using a pressure switch
- Troubleshooting simple electropneumatic controls

Recommended study media:
- Self-study program Fluid Studio® Pneumatics
- Design and simulation program FluidSIM® Pneumatics
- Textbook Electropneumatics, Basic level
- Workbook Electropneumatics, Basic level
- Transparency set Electropneumatics, Basic level
- Video Electropneumatics/electrohydraulics, Basic level

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Compressor (Order no. 091 030)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Plastic tubing, 10 m, PUN 4 x 0.75	1	151 496
Single-acting cylinder	1	152 887
Double-acting cylinder	2	152 888
Start-up valve with filter control valve, 40 µm	1	152 894
Manifold	1	152 896
Relay, three-fold**	1	162 241
Signal input, electrical**	1	162 242
Indicator unit and distributor, electrical**	2	162 244
Proximity switch, electronic, with cylinder attachment	2	167 060
3/2-way solenoid valve with LED, normally closed	1	167 073
5/2-way solenoid valve with LED	2	167 074
5/2-way double solenoid valve with LED	1	167 076
Pneumatic-electrical converter	1	177 459
Limit switch, electrical, left-actuated	1	183 322
Limit switch, electrical, right-actuated	1	183 345
Equipment tray*	1	120 772
Complete equipment set		**184 460**

(Technical data and description: Pneumatics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

** Four plug-in adapters are required for securing components to the profile plate (Order no. 323 571), see Accessories.

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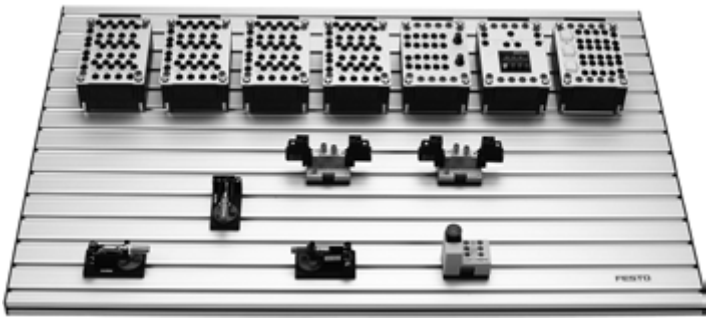
Electropneumatics equipment set, Advanced level TP 202



Training aims:
- Function and use of electropneumatic devices
- Stroke-related control with sensors
- Stroke-related control with preset counter
- Control with external conditions (e.g. single/continuous cycle, EMERGENCY OFF)
- Step diagram/process-controlled sequence control
- Position-scheduled/time-controlled sequence control
- Programmed control with permanent and deletable sequencers
- Troubleshooting large electropneumatic controls

Recommended study media:
- Self-study program Fluid Studio® Pneumatics
- Design and simulation program FluidSIM® Pneumatics
- Workbook Electropneumatics, Advanced level

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Compressor (Order no. 091 030)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Relay, three-fold**	4	162 241
Signal input, electrical**	1	162 242
Time relay, two-fold**	1	162 243
Preset counter, electrical, incrementing**	1	162 355
5/2-way double solenoid valve with LED	2	167 076
Proximity switch, inductive	1	178 574
Proximity switch, capacitive	1	178 575
Proximity switch, optical	1	178 577
EMERGENCY OFF pushbutton, electrical	1	183 347
Equipment tray*	1	120 765
Complete equipment set		**184 461**

(Technical data and description: Pneumatics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

** Four plug-in adapters are required for securing components to the profile plate (Order no. 323 571), see Accessories.

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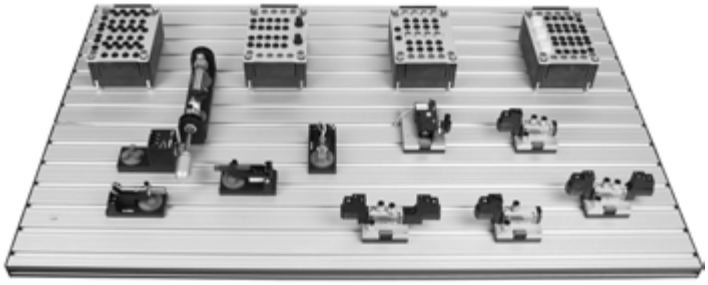
BIBB Electropneumatics equipment set



Training aims:
- Physical fundamentals of electricity and pneumatics
- Function and use of electropneumatic devices
- Displaying motion sequences and switch states
- Assembly of controls with relays
- Electrical self-latching switches
- Using a magnetic proximity switch
- Using a pressure switch
- Stroke-dependent control with sensors
- Stroke-dependent control with preset counters
- Controls with external conditions (e.g., single/continuous cycle, EMERGENCY OFF)
- Sequence-controlled/process-controlled flow control
- Scheduled/time-controlled sequence control
- Programmed control with permanent and deleting sequencers
- Troubleshooting in large electropneumatic controls

The selection of components complies with BIBB requirements, status January 2000.

Recommended study media:
- Self-study program Fluid Studio® Pneumatics
- Design and simulation program FluidSIM® Pneumatics
- BIBB Electropneumatics course

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Compressor (Order no. 091 030)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Double-acting cylinder	1	152 888
Relay, three-fold**	2	162 241
Signal input, electrical**	2	162 242
Time relay, two-fold**	1	162 243
Indicator unit and distributor, electrical**	1	162 244
Proximity switch, electronic, with cylinder attachment	2	167 060
3/2-way solenoid valve with LED, normally closed	1	167 073
5/2-way solenoid valve with LED	3	167 074
5/2-way double solenoid valve with LED	3	167 076
Pneumatic-electrical converter	1	177 459
Proximity switch, inductive	1	178 574
Proximity switch, capacitive	1	178 575
Proximity switch, optical	1	178 577
Limit switch, electrical, left-actuated	1	183 322
Equipment tray*	1	120 764
Complete equipment set		**184 462**

(Technical data and description: Pneumatics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

** Four plug-in adapters are required for securing components to the profile plate (Order no. 323 571), see Accessories.

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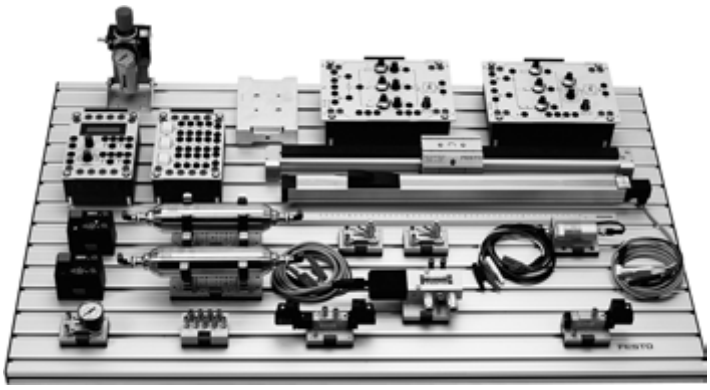
Closed-loop pneumatics, Basic level TP 111



Training aims:
- Pressure and positional control
- Action sequence of a control circuit: controlled, manipulated, disturbance and reference variables
- Activity and timing of control units: discontinuous and continuous controls, P, I, D, PI, PD, PID controls
- Behavior of control sequences: transfer characteristics, transient response, system with and without compensation, systems of first, second, third order, idle times
- Differences between open- and closed-loop control action sequences
- Interaction of closed-loop controls and control systems, control circuit optimizing, stability considerations
- Setup, commissioning and optimizing of closed-loop control assemblies, devices and systems with analog controller cards

Recommended study media:
- Self-study program Fluid Studio® Pneumatics
- Design and simulation program FluidSIM® Pneumatics
- Workbook Closed-loop Pneumatics

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Compressor (Order no. 091 030)
- Oscilloscope (Order no. 152 917)
- Digital multimeter (Order no. 035 681)
- Function generator (Order no. 152 918)
- Cable BNC-4 mm (Order no. 152 919)
- Cable BNC-BNC (Order no. 158 357)
- BNC T-connector (Order no. 159 298)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Plastic tubing, 10 m, PUN 4 x 0.75	1	151 496
3/2-way valve with pushbutton actuator, normally closed	2	152 860
Pressure gauge	1	152 865
One-way flow control valve	2	152 881
Manifold	1	152 896
Connectors	1	152 898
Quick push-pull distributor	3	153 128
Signal input, electrical**	1	162 242
3/2-way solenoid valve with LED, normally closed	1	167 073
Start-up valve with filter control valve, 5 µm	1	526 337
Equipment tray*	1	120 767
Complete closed-loop pneumatics module equipment set, general		**184 468**
Air pressure reservoir	2	152 912
PID controller**	1	162 254
Comparator**	1	162 257
5/3-way double solenoid valve, normally closed	1	167 077
5/3-way proportional valve	1	167 078
Pressure sensor, analog	1	167 094
Equipment tray*	1	120 769
Complete closed-loop pneumatics module equipment set, pressure control		**184 469**
Weight	1	034 065
Shock absorber	2	034 572
Position encoder	1	152 628
Status controller**	1	162 253
Adapter for weight	1	167 032
Mounting accessories for position encoder	1	178 441
Linear drive, pneumatic	1	192 501
Connection cable for position encoder	1	376 177
Ruler	1	525 927
Equipment tray*	1	120 770
Complete closed-loop pneumatics partial equipment set, position control* **		**184 470**
Complete equipment set Closed-loop pneumatic		**184 467**

(Technical data and description: Pneumatics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

** Four plug-in adapters are required for securing components to the profile plate (Order no. 323 571), see Accessories.

*** If no proportional valve is available, please order (Order no. 167 078).

Note:
Do not use lubricated compressed air!

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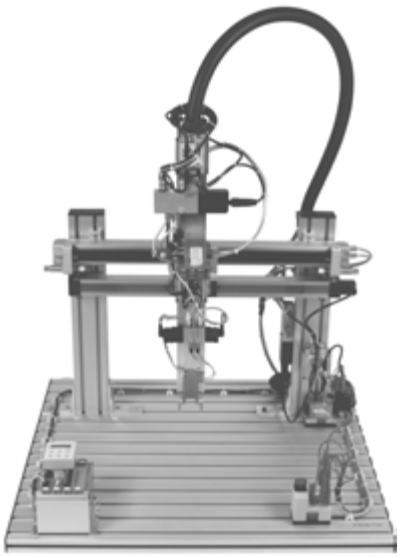
Equipment sets

PneuPos, Pneumatic positioning with the SPC 200 Axle controller



Equipment set for the setup and commissioning of single- and multi-axle pneumatic positioning systems or gantry systems in conjunction with the SPC 200 Axle controller.

The complete equipment set consists of three 3 partial equipment sets.

The equipment sets are supplied as individual components, as setup and commissioning are training aims.

PneuPos 1:
Pneumatic positioning with a pneumatic NC axle.

PneuPos 2:
Supplementary equipment set for upgrade to two-axle system. Requires equipment set PneuPos 1.

PneuPos 3:
Supplementary equipment set for pneumatic grippers for doing pick-and-place tasks. Requires equipment sets PneuPos 1 and 2.

Recommended study media:
– Workbook
Servopneumatic positioning
– Programming software
WinPISA for SPC 200
– Operating instructions for SPC 200
(Please refer to chapter: Software and Courseware)

Necessary accessories:
– Start-up valve with filter control valve, 5 µm (Order no. 526 337)

Recommended accessories:
– Aluminium profile plate, (700 x 700 mm) (Order no. 159 410)
– Compressor (Free air delivery ca. 350 l/min)
– Tabletop power supply unit or power supply unit for the mounting frame
(Technical data and description: Accessories chapter)

Options:
– Profibus DP function card for SPC 200 (Order no. 170 224)
– I/O terminal (SysLink) (Order no. 034 035)
– Mounting accessories (Order no. 035 644)

Components	Quantity	Order no.
Shock absorber	2	034 572
Plastic tubing, 5 m, PUN 3 x 0.5	1	197 118
Plastic tubing, 10 m, PUN 4 x 0.75	1	151 496
Plastic tubing, 5 m, PUN 6 x 1	1	152 963
Position encoder	1	152 628
Mounting accessories for position encoder	1	178 441
3/2-way solenoid valve with LED, normally closed	1	167 073
Axle controller SPC 200/P01 with control unit	1	170 521
EMERGENCY OFF pushbutton, electrical	1	183 347
Accessories for axle controller	1	192 491
5/3-way proportional valve	1	192 493
Axle interface for position encoder	1	192 494
EMERGENCY OFF function	1	192 495
Linear drive, pneumatic	1	192 501
Measuring lead, 1500 mm, blue	2	376 940
Measuring lead, 1500 mm, red	2	376 941
Complete partial equipment set PneuPos 1		**192 490**
Plastic tubing, 5 m, PUN 3 x 0.5	1	197 118
Plastic tubing, 10 m, PUN 4 x 0.75	1	151 496
Plastic tubing, 5 m, PUN 6 x 1	1	152 963
5/3-way proportional valve	1	192 493
Linear drive, pneumatic, with integrated position encoder	1	192 497
Axle interface for position encoder	1	192 498
Gantrykit	1	192 500
Complete partial equipment set PneuPos 2		**192 496**
I/O extension	1	395 502
Parallel-jaw gripper group, complete	1	395 503
Complete partial equipment set PneuPos 3		**192 502**

(Technical data and description: Pneumatics chapter – Components)

Note:
Do not use lubricated compressed air!

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Training packages Pneumatics
Equipment sets

Partial equipment set PneuPos 1, Pneumatic positioning with a pneumatic NC axle

Training aims:
– Setup and commissioning of a pneumatic NC axle
– Use of digital technology to implement powerful servopneumatic drive control circuits
– Programming of numerically controlled axles as per DIN 66025
– Analyzing and optimizing control response
– Visualization and assessment of motion response
– Troubleshooting NC axles
– EMERGENCY OFF function for NC axles

Order no. 192 490

Partial equipment set PneuPos 2, Supplementary equipment set upgrading to two-axle system

Training aims:
– Setup and commissioning of multi-axle pneumatic positioning systems
– Mechanical and electrical setup of a two-axis gantry system
– Programming of multi-axle positioning systems as per DIN 66025
– Analyzing and optimizing control response
– Visualization and assessment of motion response
– Troubleshooting NC axles
– EMERGENCY OFF function in a two-axle system

Equipment set PneuPos 1 is required.

Order no. 192 496

Partial equipment set PneuPos 3, Supplementary equipment set Pneumatic grippers for carrying out pick-and-place tasks

Training aims:
– Assembly and commissioning of a gripper
– Programming and implementation of handling tasks

Requires equipment sets PneuPos 1 and 2.

Order no. 192 502

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Training packages Pneumatics
Equipment sets

SoftStop, Controlled end-position cushioning with SPC 10, Single-axle system

Faster cycle times for assembly and handling processes require higher traverse speeds for pneumatic linear drives. This in turn requires special measures to brake the slide at its end positions, such as the installation of shock absorbers, the use of limit switches and their inclusion in the PLC program, control of supply by means of flow control valves – often without achieving ideal conditions.

The fast SoftStop allows an increase in cycle time of up to 30 % with optimum motion characteristic of the linear drive. Control via any 24 V signal.

Recommended study media:
– Workbook
Servopneumatic positioning
– Operating instructions for SPC 10
(Please refer to chapter: Software and Courseware)

Recommended accessories:
– Aluminium profile plate,
(1100 x 700 mm)
(Order no. 159 411)
– Compressor
– Tabletop power supply unit or power supply unit for the mounting frame
(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Plastic tubing, 5 m, PUN 6 x 1	1	152 963
Position encoder	1	152 628
Mounting accessories for position encoder	1	178 441
Adapter, Y axis	1	167 032
End-position controller SPC 10	1	170 360
5/3-way proportional valve	1	192 493
Exercises	1	197 115
Linear drive, pneumatic	1	192 501
Cable SPC 10-SPS	1	648 607
Complete equipment set		**195 897**

(Technical data and description: Pneumatics chapter – Components)

Supplementary equipment set single-axle system with SPC 10 extending to single-axle system with SPC 200 (PneuPos 1)

Recommended study media:
– Workbook
Servopneumatic positioning
– Programming software
WinPISA for SPC 200
– Operating instructions SPC 200
(Please refer to chapter: Software and Courseware)

Components	Quantity	Order no.
Shock absorber	2	034 572
Plastic tubing, 5 m, PUN 3 x 0.5	1	197 118
Plastic tubing, 10 m, PUN 4 x 0.75	1	151 496
Plastic tubing, 5 m, PUN 6 x 1	1	152 963
3/2-way solenoid valve with LED, normally closed	1	167 073
Axle controller SPC 200/P01 with control unit	1	170 521
EMERGENCY OFF pushbutton, electrical	1	183 347
Accessories for axle controller	1	192 491
Axle interface for position encoder	1	192 494
EMERGENCY OFF function	1	192 495
Measuring lead, 1500 mm, blue	2	376 940
Measuring lead, 1500 mm, red	2	376 941
Complete supplementary equipment set		**196 075**

(Technical data and description: Pneumatics chapter – Components)

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The technical data indicated here applies to all components (unless otherwise stated):

Pneumatic connection	Quick Star connectors QS-4 for plastic tubing PUN 4 x 0.75
Pneumatic medium	Filtered lubricated and unlubricated compressed air
Electrical connection	4 mm safety sockets or safety plugs
Voltage supply	24 V DC

The components for the mounting frame can alternatively be mounted on the profile plate with the aid of four plug-in adapters (Order no. 323 571) (see Accessories chapter).

Weight

TP 111, TP 511

Order no. 034 065

m

Weight with two cylinder screws. Four recessed grips facilitate handling. The weight is used for loading tests on the linear drives.
When ordering separately, please also order mounting adapter (Order no. 167 032, for pneumatic linear drive).

Mass	5 kg
Length	150 mm
Width	110 mm
Height	40 mm
Method of attachment	2 slotted screws M5

Shock absorber

PneuPos, SoftStop

Order no. 034 572

Self-setting hydraulic shock absorber for smooth deceleration. Suitable for the pneumatic linear drives (Order no. 192 497 and 192 501).
When ordering separately, please also order shock-absorber bracket (Order no. 152 908).

Stroke	12 mm
Impact speed	Maximum 3 m/s

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Training packages Pneumatics
Components

Plastic tubing, PUN 4 x 0.75

TP 101, TP 102, BIBB-P, TP 201, TP 111, PneuPos, FP 1130, TP 301

Exterior diameter _____ 4 mm
Interior diameter _____ 2.8 mm

Metallic silver	10 m	Order no. 151 496
Blue	1 m	Order no. 159 662
Black	1 m	Order no. 159 663
Yellow	1 m	Order no. 178 417
Green	1 m	Order no. 178 424
Red	1 m	Order no. 178 410

PUN 3 x 0.5

PneuPos, SoftStop

Exterior diameter _____ 3 mm
Interior diameter _____ 2.1 mm

Metallic silver	5 m	Order no. 197 118

PUN 6 x 1

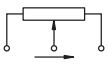
PneuPos, SoftStop

Exterior diameter _____ 6 mm
Interior diameter _____ 4 mm

Metallic silver	5 m	Order no. 152 963

Position encoder

TP 111, PneuPos, SoftStop — Order no. 152 628



Analog displacement encoder for pneumatic linear drive unit (Order no. 192 501) for determining the current actual position.
When ordering single units, please also order mounting accessories (Order no. 178 441).
The connection cable (Order no. 376 177) is required for use in TP 111.

Measuring stroke _____ 450 mm
Mass _____ 1.2 kg
Output signal at cable output of connection cable (Order no. 376 177) _____ 0 – 10 V

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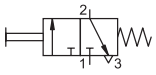
3/2-way valve with pushbutton actuator, normally closed

TP 101, TP 102, BIBB-P, TP 111, FP 1130

Order no. 152 860

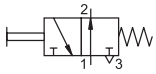


Design _____ Poppet valve, directly actuated, one side, with return spring
Pressure range _____ 0 – 800 kPa (0 – 8 bar)
Nominal flow rate 1...2 _____ 60 l/min

normally open

TP 101, BIBB-P

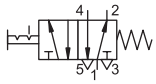
Order no. 152 861



5/2-way valve with selector switch

TP 101, BIBB-P

Order no. 152 862



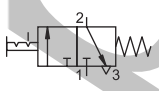
This valve combination behaves like a 5/2-way valve. The valves are actuated by rotating the selector switch. When the selector switch is released, the current circuit state is retained.

Design _____ Poppet valve, direct actuated, one side, with return spring
Pressure range _____ 0 – 800 kPa (0 – 8 bar)
Nominal flow rate 1...2 _____ 60 l/min

3/2-way valve with selector switch, normally closed

TP 102

Order no. 152 863



The valve isactuated by rotating the selector switch. When the selector switch is released, the current circuit state is retained. When the selector switch is turned to the normal position, the valve is returned to its initial position by a return spring.

Design _____ Poppet valve, directly actuated, one side, with return spring
Pressure range _____ 0 – 800 kPa (0 – 8 bar)
Nominal flow rate 1...2 _____ 60 l/min

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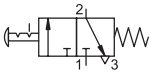
Components

3/2-way valve with mushroom-head emergency switch (red), normally closed

TP 102

Order no. 152 864



The valve is actuated by pressing the red mushroom-head emergency button. When the pushbutton is released, the circuit state is retained. The mushroom-head emergency button is returned to its normal position by rotating clockwise and the valve is returned to its initial position by a return spring.

Design	Poppet valve, directly actuated, one side, with return spring
Pressure range	0 – 800 kPa (0 – 8 bar)
Nominal flow rate 1...2	60 l/min

Pressure gauge

TP 101, BIBB-P, TP 111

Order no. 152 865

The pressure gauge shows the pressure in pneumatic control circuits.

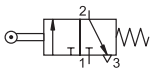
Design	Bourdon tube pressure gauge
Display range	0 – 1000 kPa (0 – 10 bar)
Quality class	1.6

Tip:
For measuring low pressures, attach pressure gauge (Order no. 013 777).

3/2-way roller lever valve, normally closed

TP 101, TP 102, BIBB-P

Order no. 152 866



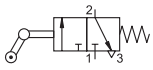
The roller lever valve is actuated when the roller lever is pressed, for example by the cam of a cylinder. After release of the roller lever, the valve is returned to its initial position by a return spring.

Design	Poppet valve, directly actuated, one side, with return spring
Pressure range	0 – 800 kPa (0 – 8 bar)
Nominal flow rate 1...2	80 l/min

3/2-way roller lever valve with idle return, normally closed

TP 101, BIBB-P

Order no. 152 867



The roller lever valve with idle return is actuated when the roller lever is traversed by the cam of a cylinder in a certain direction. After release of the roller lever, the valve is returned to its initial position by a return spring. When traversed in the reverse direction, the roller lever has an idle return and the valve is not actuated.

Design	Poppet valve, directly actuated, one side, with return spring
Pressure range	0 – 800 kPa (0 – 8 bar)
Nominal flow rate 1...2	80 l/min

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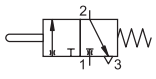
Back pressure valve

TP 102

Order no. 152 868



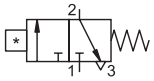
The back pressure valve with plunger control is actuated by the face of the cylinder cam. The supply pressure can be regulated by means of a one-way flow control valve.

Supply pressure range _____ 0 – 800 kPa (0 – 8 bar)
Closing force at 600 kPa (6 bar) _____ 12.5 N

Pneumatic proximity switch

TP 102

Order no. 152 870



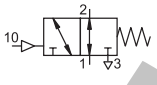
A permanent magnet mounted on the piston of a cylinder actuates a pneumatic 3/2-way valve when traversed, thus triggering a control signal. A reproducible switching accuracy of 0.1 mm can be achieved if the sensor is approached from the connection side. Includes connectors and kit for cylinder mounting.

Display _____ Optical position display
Pressure range _____ 200 – 800 kPa (2 – 8 bar)
Signal pressure _____ Same as operating pressure
Flow rate 1...2 _____ Q_{nn} 40 l/min minimum
Flow rate 2...3 _____ Q_{nn} 40 l/min minimum

3/2-way pneumatic valve, pneumatically actuated, one side, convertible

TP 102, BIBB-P

Order no. 152 871

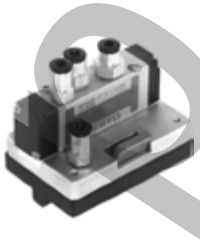


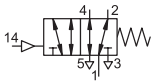
Design _____ Spool valve, directly actuated, one side, with return spring
Pressure range _____ 250 – 1000 kPa (2.5 – 10 bar)
Nominal flow rate 1...2 _____ 500 l/min
Convertible to:
Nominal flow rate 1...4 _____ 500 l/min
Response time at 600 kPa (6 bar) _____ On: 20 ms, Off: 30 ms

5/2-way valve, pneumatically actuated, one side

TP 101, TP 102

Order no. 152 872





The pneumatic double pilot valve is reversed by pneumatic signals from alternate sides, and following removal of the signal is returned to its initial position by a return spring.

Design _____ Spool valve, directly actuated one side, with return spring
Pressure range _____ 250 – 1000 kPa (2.5 – 10 bar)
Nominal flow rate 1...2 _____ 500 l/min
Nominal flow rate 1...4 _____ 500 l/min
Response time at 600 kPa (6 bar) _____ On: 20 ms, Off: 30 ms

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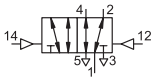
Components

5/2-way double pilot valve, pneumatically actuated, both sides

TP 101, TP 102, BIBB-P

Order no. 152 873



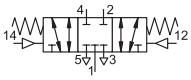
The pneumatic double pilot valve is reversed by pneumatic signals from alternate sides. The circuit state is retained after removal of the signal until the next counteracting signal.

Design	Spool valve, directly actuated, both sides
Pressure range	250 – 1000 kPa (2.5 – 10 bar)
Nominal flow rate 1...2	500 l/min
Nominal flow rate 1...4	500 l/min
Response time at 600 kPa (6 bar)	5 ms

5/3-way valve, pneumatically actuated, both sides, normally closed

BIBB-P

Order no. 152 874



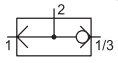
In the normal position (mid-position centered by springs) all pneumatic ports are closed. The valve is reversed to the appropriate switch position by pneumatic signals to the control ports.

Design	Spool valve, directly actuated, both sides
Pressure range	300 – 800 kPa (3 – 8 bar)
Nominal flow rate 1...2	500 l/min
Nominal flow rate 1...4	500 l/min
Response time at 600 kPa (6 bar)	5 ms

Shuttle valve (OR)

TP 101, BIBB-P

Order no. 152 875



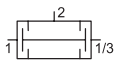
The shuttle valve is switched through to the output by applying compressed air to one of the inputs (OR function).

Design	OR gate (shuttle valve)
Pressure range	100 – 1000 kPa (1 – 10 bar)
Nominal flow rate 1, 1/3...2	500 l/min

Dual-pressure valve (AND)

TP 101, BIBB-P

Order no. 152 876



The dual-pressure valve is switched through to the output by applying compressed air to both of the inputs (AND function).

Design	AND gate (dual-pressure valve)
Pressure range	100 – 1000 kPa (1 – 10 bar)
Nominal flow rate 1, 1/3...2	550 l/min

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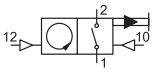
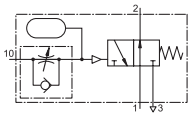
Pneumatic preset counter | TP 102 | Order no. 152 877



The pneumatic preset counter counts pneumatic signals, decrementing from a pre-set number. When zero is reached, the counter emits a pneumatic output signal.

Design	Mechanical counter with pneumatic drive
Display	5-digit, character size 4.5 mm
Reset	Manual pushbutton or pneumatic signal
Pressure range	200 – 800 kPa (2 – 8 bar)
Minimal pulse duration Drive	10 ms
Minimal pulse duration Reset	180 ms
Continuous counting frequency	2 Hz

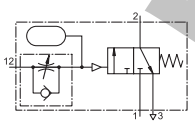
Time-delay valve, normally open | TP 102 | Order no. 152 878



The time delay can be set with an adjusting screw (infinitely variable).

Design	Poppet valve with return spring
Pressure range	0 – 800 kPa (0 – 8 bar)
Control pressure at 600 kPa (6 bar)	320 kPa (3,2 bar)
Nominal flow rate 1...2	65 l/min
Delay	0.25 – 5 s (adjustable)

Time-delay valve, normally closed | TP 101, BIBB-P | Order no. 152 879



The time delay can be set with an adjusting screw (infinitely variable).

Design	Poppet valve with return spring
Pressure range	0 – 800 kPa (0 – 8 bar)
Control pressure at 600 kPa (6 bar)	300 kPa (3 bar)
Nominal flow rate 1...2	90 l/min
Delay	0.25 – 5 s (adjustable)

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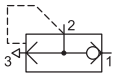
Components

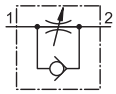
Quick-exhaust valve | TP 101, BIBB-P | Order no. 152 880



Quick-exhaust valve with built-in silencer.

Design _____ Poppet valve
Pressure range _____ 50 – 1000 kPa (0.5 – 10 bar)
Nominal flow rate 1...2 _____ 300 l/min
Nominal flow rate 2...3 _____ 390 l/min

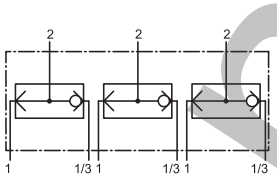
One-way flow control valve | TP 101, TP 102, BIBB-P, TP 111, FP 1130 | Order no. 152 881



The one-way flow control valve is a combination of flow control valve and a non-return valve. The cross-section of the restrictor can be set by means of a knurled screw.

Design _____ Combined flow control valve
Pressure range _____ 30 – 1000 kPa (0.3 – 10 bar)
Nominal flow rate
in flow control direction _____ 0 – 180 l/min
in open direction _____ 180/110 l/min
(Throttle valve open/closed)

Shuttle valve, 3-fold (OR) | TP 102 | Order no. 152 882



Valve block with three OR elements.

Design _____ OR gate (Shuttle valve, 3-off)
Pressure range _____ 160 – 800 kPa (1.6 – 8 bar)
Nominal flow rate 1, 1/3...2 _____ 100 l/min

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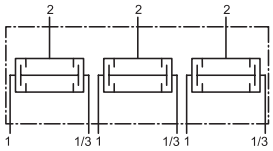
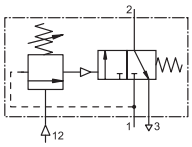
Dual-pressure valve, 3-fold (AND) | TP 102 | Order no. 152 883



Valve block with three AND elements.

Design _____ AND gate (dual-pressure valve)
Pressure range _____ 160 – 800 kPa (1.6 – 8 bar)
Nominal flow rate 1, 1/3...2 _____ 100 l/min

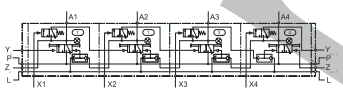
Pressure sequence valve | TP 101, BIBB-P | Order no. 152 884



The pressure of the control signal can be set by means of the pressure setting screw (infinitely variable).

Design _____ Poppet valve with return spring
Operating pressure range _____ 180 – 800 kPa (1.8 – 8 bar)
Control pressure range _____ 100 – 800 kPa (1 – 8 bar)
Nominal flow rate 1...2 _____ 100 l/min

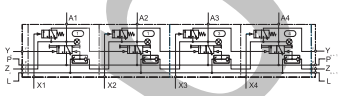
Stepper module | TP 102, BIBB-P | Order no. 152 886



Stepper module, comprising three TAA modules and one TAB module.

Design _____ Poppet valve with integrated AND and OR gates
Nominal flow rate P...A _____ 60 l/min
Pressure range _____ 200 – 800 kPa (2 – 8 bar)

Expansion | TP 102 | Order no. 152 885



The stepper controller results from connection of Type TAA basic modules. This module comprises a memory (5/2-way double pilot valve) and an AND or OR element, with display and manual override.

Preliminary

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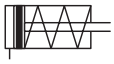
Components

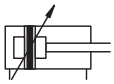
Single-acting cylinder | TP 101, BIBB-P, TP 201, TP 301 | Order no. 152 887



Single-acting cylinder with control cams.

Design _____ Piston cylinder
Operating pressure _____ Maximum 1000 kPa (10 bar)
Stroke length _____ Maximum 50 mm
Thrust at 600 kPa (6 bar) _____ 150 N
Spring return force minimal _____ 13.5 N

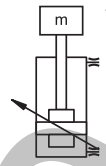
Double-acting cylinder | TP 101, BIBB-P, TP 201, BIBB-EP, TP 301 | Order no. 152 888



Double-acting cylinder with control cams. End-position cushioning with two adjusting screws. A permanent magnet is mounted on the cylinder piston. Its magnetic field can trigger a proximity switch.

Design _____ Piston cylinder
Operating pressure _____ Maximum 1000 kPa (10 bar)
Stroke length _____ Maximum 100 mm
Thrust at 600 kPa (6 bar) _____ 165 N
Return thrust at 600 kPa (6 bar) _____ 140 N

Driving/tractive load | BIBB-P | Order no. 152 889



Demonstration of a tractive or driving load. Consisting of a double-acting cylinder, a weight of 60 N and two one-way flow control valves. Mounting on the profile plate is by means of 2 hammerhead nuts.

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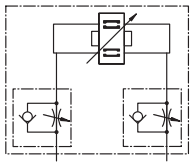
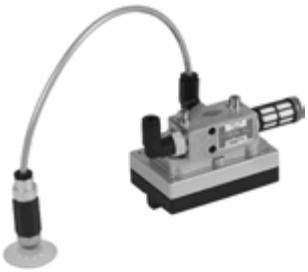
Linear drive, pneumatic TP 102 Order no. 152 890

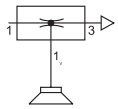


The linear drive consists of a pneumatic drive (rodless cylinder) and a linear guide with slide. The linear drive is equipped with quick push-pull connector and adjustable one-way flow control valves. The round bars parallel to the cylinder rod can be used for mounting pneumatic and electrical proximity switches for position encoding. End-position cushioning, adjustable at both ends, prevents hard impact of the piston against the cylinder barrel.
When ordering separately, please also order the adapter set (Order no. 150 519) for mounting on the profile plate.

Operating pressure _____ Maximum 700 kPa (7 bar)
Stroke length _____ Maximum 200 mm
Thrust at 600 kPa (6 bar) _____ 90 N
Breakaway force, solenoid clutch _____ 160 N

Vacuum nozzle/suction cup TP 102 Order no. 152 891





Vacuum nozzle and suction cup.

Design _____ Ejector principle
Pressure range _____ 150 – 1000 kPa (1.5 – 10 bar)
Vacuum at 600 kPa (6 bar) _____ Minumum 85 kPa (0,85 bar)
Air consumption at 600 kPa (6 bar) _____ 15 l/min
Switching frequency at 600 kPa (6 bar) ____ Maximum 10 Hz with 1 m tube

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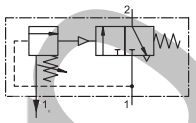
Adjustable vacuum control TP 102 Order no. 152 892



Adjustable vacuum control with valve body. The adjustable vacuum control is used for direct conversion of a vacuum signal into a normal pressure signal.

Design _____ Valve set for vacuum actuation of pilot control
Vacuum range _____ -20 – -95 kPa (-0.2 – -0.95 bar) adjustable from -25 – -60 kPa (-0.25 – -0.6 bar)
Switching hysteresis _____ Maximum 20 kPa (0.2 bar)
Maximum pressure of valve body _____ 800 kPa (8 bar)

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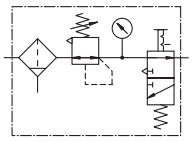
Training packages Pneumatics
Components

Optical display (red) | BIBB-P | Order no. 152 893

The pneumatically operated optical display is actuated if the pressure in the line is greater than 150 kPa (1.5 bar). Suitable for monitoring and display of operational status.

Design _____ Reflection principle
Display color _____ Red
Pressure range _____ 150 – 800 kPa (1.5 – 8 bar)

Start-up valve with filter control valve, 40 µm | TP 101, BIBB-P, TP 201, FP 1130, TP 301 | Order no. 152 894

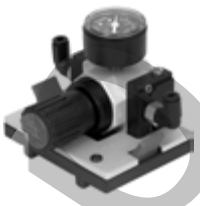


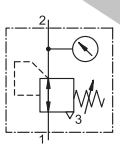
Filter control valve with pressure gauge, start-up valve, quick push-pull connectors and quick couplings, mounted on a swivel support.
The filter with water separator removes dirt, pipe sinter, rust and condensed water. The pressure control valve regulates the supply air pressure to the set operating pressure and compensates pressure fluctuations. The filter bowl has a condensate drain valve.
The start-up valve/shutoff valve ventilates and vents the entire control. The 3/2-way valve is actuated by a rotary button.

Design _____ Sintered filter with water trap, piston regulator valve
Nominal flow rate* _____ 750 l/min
Input pressure _____ Maximum 1600 kPa (16 bar)
Working pressure _____ Maximum 1200 kPa (12 bar)
Grade of filtration _____ 40 µm
Condensate quantity _____ 14 cm^3
Connector _____ G 1/8, QS-6, for plastic tubing PUN 6 x 1

* Input pressure: 1000 kPa (10 bar), Operating pressure: 600 kPa (6 bar), Differential pressure: 100 kPa (1 bar).

Pressure regulator valve with gauge | TP 101, BIBB-P | Order no. 152 895





The pressure regulator valve with gauge regulates the supply air pressure to the set operating pressure and compensates pressure fluctuations.

Design _____ Piston regulator valve
Nominal flow rate* _____ 800 l/min
Input pressure _____ Maximum 1600 kPa (16 bar)
Working pressure _____ Maximum 1200 kPa (12 bar)

* Input pressure: 1000 kPa (10 bar), Operating pressure: 600 kPa, Differential pressure: 100 kPa (1 bar).

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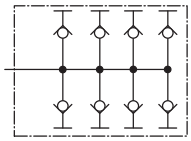
Manifold — TP 101, BIBB-P, TP 201, TP 111, TP 301 — Order no. 152 896



Manifold with eight self-closing non-return valves. A common manifold (QS-6 for plastic tubing PUN 6 x 1) allows supply of compressed air to the control via eight individual ports (QS-4 for plastic tubing PUN 4 x 0.75).

Connector _____ G 1/8

Connection elements — TP 101, TP 102, BIBB-P, TP 111 — Order no. 152 898

(Not shown)

Various quick push-pull connectors, seals and small parts.

Air pressure reservoir — TP 101, BIBB-P, TP 111 — Order no. 152 912

Air pressure reservoir for generating static pressure with the aid of a one-way flow control valve, for the generation of long time delays in conjunction with time-delay and flow control valves, for compensation of pressure fluctuations, as reservoir for sudden pressure drop, and for generation of a control system with a delay of the 1st order.

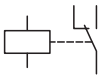
Design _____ Brazed tank
Capacity _____ 400 ml
Pressure range _____ 0 – 1600 kPa (0 – 16 bar)

Aluminium profile plate — TP 101-1, TP 101-2, TP 101-3, TP 101-4 — Order no. 159 333

(Not shown)

Aluminium profile plate, 350 x 250 mm, suitable for TP 101partial equipment sets. Fits Systainer.

Relay, three-fold — TP 201, TP 202, BIBB-EP, TP 601, TP 602, TP 701, TP 702 — Order no. 162 241



The device has three relays with terminals and two buses for power supply.

Contact set _____ 4 change-over switches
Contact load _____ Maximum 5 A
Cut-off load _____ Maximum 90 W
Pick-up time _____ 10 ms
Drop-off time _____ 8 ms

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Components

Signal input, electrical

TP 201, TP 202, BIBB-EP, TP 111, TP 601, TP 701, TP 301

Order no. 162 242

The device contains an illuminated pushbutton switch (control switch) and two illuminated pushbuttons (momentary contact switches) with terminals and two buses for power supply.

Contact set _____ 2 makes, 2 breaks
Contact load _____ Maximum 1 A
Power consumption (Miniature bulb) _____ 0.48 W

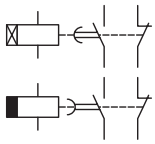
Time relay, two-fold

TP 202, BIBB-EP, TP 602, TP 702

Order no. 162 243

The element contains a release-delay and a pickup-delay time relay. Both relays are infinitely variable, using the rotary knob of the potentiometer.

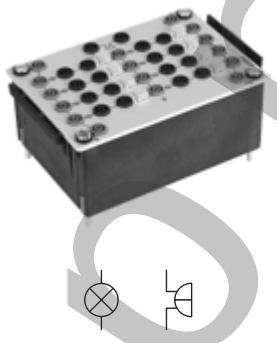
Contact set _____ 2 makes, 2 breaks
Contact load _____ Maximum 5 A
Cut-off load _____ Maximum 100 W
Delay _____ 0.5 – 10 s adjustable



Indicator unit and distributor, electrical

TP 201, BIBB-EP, TP 601, TP 602, TP 702, TP 552, TP 301

Order no. 162 244



The device contains an acoustic indicator and four lamps with terminals and three buses for power supply. Through-contact socket pairs per lamp allow the element to also be used as a distributor.

Power consumption acoustic indicator ____ 0.04 W
Power consumption indicator lamps _____ 1.2 W
Frequency acoustic indicator _____ 420 Hz

preview

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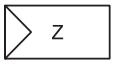
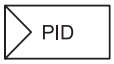
Status controller / PID controller TP 111, TP 511



The controller comprises the following:
– Voltage supply
– Differential inputs
– Comparators
– Final control elements:
positional control elements, speed control elements, acceleration control elements (status controller), proportional control elements, integral control elements, differential control elements (PID controller)
– Overall gain (Status controller)
– Correcting variable offset
– Summing junction
– Limiter
– Output



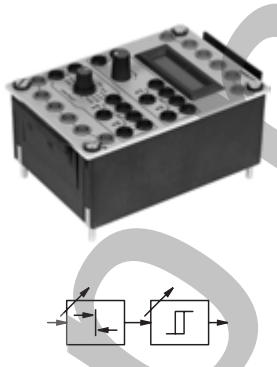
Overmodulation indicator	-10 > Ue > +10 V
Input voltage range	-13 – +13 V
Output voltage limitation	[0 – +10 V] [-10 – +10 V]
Correcting variable offset	5 ±3.5 V at [0 – +10 V] 0 ±7 V at [-10 – +10 V]

Position coefficient Kx	0 – 10 (status controller)
Speed coefficient Kx	0 – 100 ms (status controller)
Acceleration coefficient Kx	0 – 10 s^2 (status controller)
Overall gain P	0 – 1000 (status controller)

Proportional coefficient KP	0 – 1000 (PID controller)
Integral coefficient KI	0 – 1000 s^{-1} (PID controller
Differential coefficient KD	0 – 1000 ms (PID controller)

Status controller	Order no. 162 253
PID controller	Order no. 162 254

Comparator TP 111, TP 702 Order no. 162 257



Positive switching comparator with hysteresis. The inputs are short-circuit-proof or surge-proof to 24 V. 2 separate inputs (IN A, IN B) each acting on two independent comparators. Each comparator can be set to: Reference voltage (-10 – +10 V), Hysteresis (0 – +5 V).

Input voltage (inputs A and B)	-10 – +10 V
Input resistance (inputs A and B)	>10 kΩ
Display accuracy	±30 mV
Outputs A and B	Floating relay contacts, changeover contacts
Contact load	24 V DC/2 A and 120 V AC/1 A

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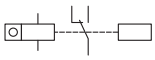
Components

Preset counter, electrical, incrementing



TP 202, TP 602 — Order no. 162 355

Electrical preset counter, with terminals and two buses for power supply.

Contact set	1 change-over
Contact load	Maximum 1 A
Power consumption	2.4 W
Counter pulse	Minumum 20 ms
Display	3-character

Adapter, Y axis

(Not shown)

SoftStop — Order no. 167 032

Adapter for mounting of weight on pneumatic linear drive (Order no. 192 501).

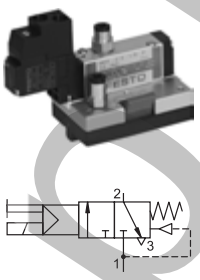
Proximity switch, electronic, with cylinder attachment

TP 201, BIBB-EP, TP 301 — Order no. 167 060

The proximity switch consists of a sensor, the mounting kit, and the cable. This proximity switch gives a signal when it detects a magnetic field. The status is indicated by an LED.

Switching voltage	10 – 30 V DC
Switching current	Maximum 200 mA
Switching power	6 W
Switch accuracy	±0.1 mm

3/2-way solenoid valve with LED, normally closed



TP 201, BIBB-EP, TP 111, PneuPos, SoftStop — Order no. 167 073

The status is indicated by an LED on the housing. The valve is equipped with a manual override. The electrical connections feature polarity-reversal protection for the LED and the suppressor circuit.

Pneumatic technical data

Design	Spool valve, pilot controlled, with return spring
Pressure range	250 – 800 kPa (2.5 – 8 bar)
Response time at 600 kPa (6 bar)	On: 20 ms, Off: 30 ms
Nominal flow rate 1...2	500 l/min

Electrical technical data

Power consumption	1.5 W
Duty cycle	100 %

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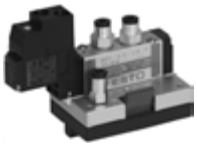
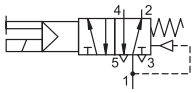
5/2-way solenoid valve with LED, normally open

TP 201, BIBB-EP, TP 301

Order no. 167 074





The status is indicated by an LED on the housing. The valve is equipped with a manual override. The electrical connections feature polarity-reversal protection for the LED and the suppressor circuit.

Pneumatic technical data

Design	Spool valve, pilot controlled, with return spring
Pressure range	250 – 800 kPa (2.5 – 8 bar)
Response time at 600 kPa (6 bar)	On: 20 ms, Off: 30 ms
Nominal flow rate 1...2	500 l/min
Nominal flow rate 1...4	500 l/min

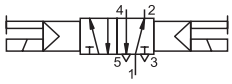
Electrical technical data

Power consumption	1.5 W
Duty cycle	100 %

5/2-way double solenoid valve with LED

TP 201, TP 202, BIBB-EP, TP 301

Order no. 167 076



The statuses are indicated by LEDs on the housings. The valve is equipped with two manual overrides. The electrical connections feature polarity-reversal protection for the LEDs and the suppressor circuits.

Pneumatic technical data

Design	Spool valve, with pilot control
Pressure range	150 – 800 kPa (1.5 – 8 bar)
Response time at 600 kPa (6 bar)	10 ms
Nominal flow rate 1...2	500 l/min
Nominal flow rate 1...4	500 l/min

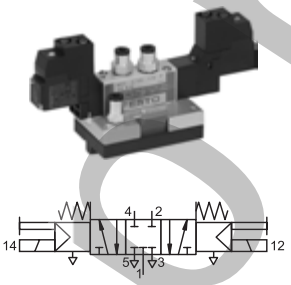
Electrical technical data

Power consumption	1.5 W
Duty cycle	100 %

5/3-way solenoid valve with LED, normally closed

TP 111

Order no. 167 077



The statuses are indicated by LEDs on the housings. The valve is equipped with two manual overrides. The electrical connections feature polarity-reversal protection for the LEDs and the suppressor circuits.

Pneumatic technical data

Design	Spool valve with piloted return spring
Pressure range	300 – 800 kPa (3 – 8 bar)
Response time at 600 kPa (6 bar)	On: 15 ms, Off: 40 ms
Nominal flow rate 1...2	500 l/min
Nominal flow rate 1...4	500 l/min

Electrical technical data

Power consumption	1.5 W
Duty cycle	100 %

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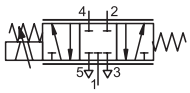
Components

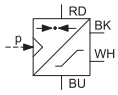
5/3-way proportional valve — TP 111 — Order no. 167 078



The integrated electronic control of the slide path allows favorable static and dynamic characteristics, as reflected by low hysteresis (<0.3 %), short switching time (typically 5 ms) and higher upper critical frequency (approx. 100 Hz). For this reason the valve is particularly suitable as an actuator for position control of a pneumatic cylinder, particularly in conjunction with a higher-level position controller.

Medium	Compressed air, microfiltered (unlubricated)
Pressure range	600 – 1000 kPa (6 – 10 bar)
Flow rate at nominal pressure	Maximum 700 l/min
Power consumption	2 – 20 W
Analog setpoint voltage	0 – 10 V DC
Nominal value at pneumatic mid-position	5 V DC
Duty cycle in accordance with VDE 0580	100 %

Pressure sensor, analog — TP 111 — Order no. 167 094



Pressure measuring range*	0 – 1000 kPa (0 – 10 bar)
Maximum permissible pressure	1400 kPa (14 bar)
Power supply	12 – 30 V DC
Output signals	Voltage output 0 – 10 V Current output 0 – 20 mA
Frequency, maximum	100 Hz
Electrical protection	Short-circuit proof, polarity reversal protected

* The sensor will also supply a signal at pressures of <0 bar. Linearity and proportionality cannot be guaranteed in this case.

End-position controller SPC 10 — SoftStop — Order no. 170 360

Electronically controlled end-position cushioning for pneumatic linear drive (Order no. 192 501) with adjustable fixed stops.

Power consumption with valve	1.1 A
Digital inputs	0 – 5 V (for logical 0) 15 – 30 V (for logical 1)
Digital outputs	Maximum 0.25 A
Input linear potentiometer	0 – +10 V
Valve output	0 – +10 V

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Axle controller SPC 200/P01 with control unit

PneuPos, SoftStop supplement

Order no. 170 521

The SPC 200 is a position controller for pneumatic axles (such as Order no. 192 501). The main features are:
– Optimized for 2 axles
– Expandable up to 4 axles with subcontroller
– Quick installation of valve and measuring system via axle interface
– Modular system
– Simple operation and programming via control unit
– Convenient programming with WinPISA software
– Link to higher-order controller via freely programmable inputs and outputs
When ordering separately, please also order accessories for axle controller (Order no. 192 491) for mounting on profile plate and electrical connection.

Inputs/outputs	10 digital inputs/8 digital outputs 24 V DC 7 inputs/6 outputs freely programmable
Interfaces	RS-232 programming interface
Programming	NC programming as per DIN 66025, command set covers positioning commands, I/O and register operations

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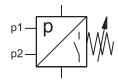
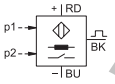
Pneumatic-electrical converter

TP 201, BIBB-EP, FP 1130

Order no. 177 459





The pneumatic-electrical converter can fulfill 3 functions:
Pressure switch, vacuum switch, and differential pressure switch.

Pneumatic technical data

Design	Prestressed metal bellows initiator
Pressure ranges:	
Pressure switch, connector P1	25 – 800 kPa (0.25 – 8 bar)
Vacuum switch, connector P2	-20 – -80 kPa (-0.2 – -0,8 bar)
Differential pressure switch:	
connectors P1...P2	-95 – 800 kPa (-0.95 – 8 bar)
Hysteresis	Maximum 25 kPa (0.25 bar)

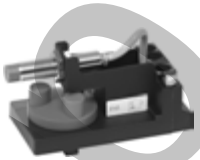
Electrical technical data

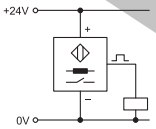
Switching current	400 mA

Proximity switch, inductive

TP 202, BIBB-EP, TP 602, TP 701, TP 301

Order no. 178 574





Proximity switch that detects the proximity of electrically conducting objects through a change in inductance and emits a signal. The proximity switch has a PNP output and is designed as a normally-open contact. A yellow LED indicates the status. The switch is protected against polarity reversal, overload and short-circuit.

Switching voltage	10 – 30 V DC
Nominal switching distance	4 mm (material S 235 JR)
Switching frequency	Maximum 800 Hz
Output function	Normally open contact, positive switching
Output current	Maximum 400 mA

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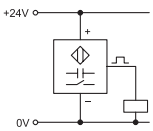
Components

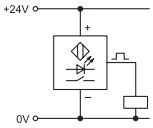
Proximity switch, capacitive — TP 202, BIBB-EP, TP 602, TP 702, TP 301 — Order no. 178 575



Proximity sensor that detects the presence of any object by a change in capacitance and emits a signal. The proximity switch has a PNP output and is designed as a normally-open contact. A yellow LED indicates the status. The switch is protected against polarity reversal, overload and short-circuit.

Switching voltage	10 – 30 V DC
Nominal switching distance	4 mm
Switching frequency	Maximum 100 Hz
Output function	Normally open contact, positive switching
Output current	Maximum 200 mA

Proximity switch, optical — TP 202, BIBB-EP, TP 602, TP 702, TP 301 — Order no. 178 577



Proximity switch that responds to light signals and delivers an electrical signal. The switching distance can be adjusted by means of a potentiometer. The proximity switch has a PNP output and is designed as a normally-open contact. A yellow LED indicates the status. The switch is protected against polarity reversal, overload and short-circuit.

Switching voltage	10 – 30 V DC
Nominal switching distance	0 – 100 mm (adjustable)
Switching frequency	Maximum 200 Hz
Output function	Normally open contact, positive switching
Output current	Maximum 100 mA

Limit switch, electrical, left-actuated — TP 201, BIBB-EP, TP 601, TP 702 — Order no. 183 322

The electrical limit switch comprises a mechanically operated microswitch. When the roller lever is pressed, for example by the control cam of a cylinder, the microswitch is actuated. The circuit is closed or opened via the contacts. The microswitch can be wired as a normally-open, normally-closed or changeover contact.

Contact load	Maximum 5 A
Switching frequency	Maximum 200 Hz
Reproducible accuracy	0.2 mm
Switch travel	2.7 mm
Actuator force	5 N

Right-actuated — TP 201 — Order no. 183 345

pneumatic

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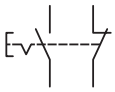
EMERGENCY OFF pushbutton, electrical

TP 202, PneuPos, SoftStop, TP 602 — Order no. 183 347



EMERGENCY OFF pushbutton, consisting of an illuminated mushroom-head emergency button and a contact set with 1 make and 1 break. Accommodated in yellow plastic housing.

Actuator	Mushroom-head key with detent ring
Contact set	1 make, 1 break
Contact load limit	Maximum 8 A

5/3-way proportional valve

PneuPos, SoftStop — Order no. 192 493

Electrically controlled proportional valve, blocked in mid-position. The pneumatic output signal is proportional to the electrical input signal. Including mounting material, shock absorber and connectors.

Medium	Filtered (5 µm), unlubricated compressed air
Pressure range	600 – 1000 kPa (6 – 10 bar)
Flow rate at nominal pressure	Maximum 750 l/min
Operating voltage, rated	24 V DC (17 – 30 V DC)
Power consumption	Maximum 20 W
Analog setpoint voltage	0 – 10 V DC
Duty cycle	100 %
Hysteresis	Maximum 0.4 %
Cut-off frequency	100 Hz
Acting time	4.2 ms

Axle interface for position encoder

PneuPos, SoftStop

The interface connects axle controller, position encoder and proportional valve via connectorized cable. One position encoder and proportional valve combination can be connected per interface, driving a pneumatic axle. A second axle interface is required for a dual axle system – this is connected to the axle interface of the first axle.

Analog measuring system (potentiometer):	
Without installation material/connection cable	Order no. 170 228
With installation material/connection cable	Order no. 192 494
Digital measuring system:	
Without installation material/connection cable	Order no. 170 231
With installation material/connection cable	Order no. 192 498

EMERGENCY OFF function

PneuPos, SoftStop — Order no. 192 495

(Not shown)

Kit for implementing EMERGENCY OFF function for pneumatic linear drives.

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Training packages Pneumatics
Components

Linear drive, pneumatic, with integrated position encoder

PneuPos — Order no. 192 497

Rodless linear drive with linear guidance system with recirculating ball bearings and integrated position encoder. The position encoder is non-contact and therefore wear-free. Including installation material, shock absorbers and connectors.

Pneumatic linear unit

Mode of operation	Double-acting
Type of interrogation	Magnetostrictive
Type of cushioning	End-position cushioning, adjustable both ends
Rotation protection	Guide
Stroke length	225 mm
Overall length	526 mm
Operating pressure	200 – 800 kPa (2 – 8 bar)

Encoder

Operating voltage	14.5 – 26.5 V DC
Power consumption	30 mA
Output signal	Start/stop RS 422
Hysteresis	≤0.09 mm
Linearity	≤ ±0.05 % of measured path/ minimum ±0.05 mm
Repeatability	≤ ±(0.001 % of measured path ±0.02 mm)

Gantry kit

PneuPos — Order no. 192 500

(Not shown)

Kit for the setup of a gantry with the pneumatic linear drive (Order no. 192 501).

Measuring lead

PneuPos, SoftStop

Flexible measuring lead with 4 mm safety plugs.

Blue	1500 mm	Order no. 376 940
Red	1500 mm	Order no. 376 941

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Linear drive, pneumatic, with guide

TP 111, PneuPos

For proximity sensing, with positive-locking between piston and carrier, and adjustable end-position cushioning.
– Space-saving rodless linear drive.
– Double-acting cylinder; compressed air for forward and return strokes.
– Power application point is protected against rotation around the longitudinal axis.
– Adjustable end-position cushioning in both end positions.
– Permanent magnet mounted on piston to allow position sensing by a suitable proximity switch. This allows proximity sensing of end positions and intermediate positions.
– More compact than conventional cylinders through rodless design.

Type of damping	Pneumatic, adjustable
Buffering length	18 mm
Rotation protection	Guide
Stroke length	450 mm
Overall length	650 mm
Pressure range	200 – 800 kPa (2 – 8 bar)
Type of port/diameter	Thread G 1/8 "
Usable power (theoretical) at 600 kPa (6 bar)	295 N
Air consumption at 6 bar	0.03 l/ stroke

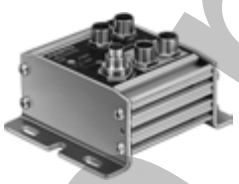
Including connection and mounting material — Order no. 192 501

Matching position encoder system for positioning tasks	Order no. 152 628
Matching adapter for weight (Order no. 034 065)	Order no. 377 305
Matching ruler	Order no. 525 927
Matching shock absorber	Order no. 034 572

Connectors — TP 101-2, TP 101-3, TP 101-4 — Order no. 395 128

(Not shown) Kit for connecting two profile plates (Order no. 159 333).

I/O extension — PneuPos — Order no. 395 502



Function I/O module with two digital inputs and two digital outputs for connection to the SPC 200 to control the pneumatic gripper. Including installation material and connection cables.

Parallel gripper module, complete — PneuPos — Order no. 395 503

(Not shown) Kit for a pneumatic parallel gripper including installation material for the pneumatic linear drive (Order no. 192 497). With connectors, solenoid valve and connection cables.

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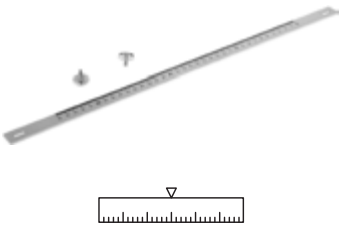
Training packages Pneumatics
Components

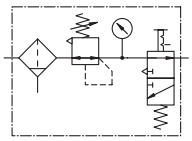
Ruler | TP 111 | Order no. 525 927



Ruler, with millimeter scale printed on both sides, with two knurled screws.
Used to measure position of the guides of the linear drive (Order no. 192 501).

Total length	500 mm
Scale length	450 mm
Unit of measurement	mm

Start-up valve with filter control valve, 5 µm | TP 111 | Order no. 526 337



Filter control valve with pressure gauge, start-up valve, quick push-pull connectors and quick couplings, mounted on a swivel support.
The filter with water separator removes dirt, pipe sinter, rust and condensed water. The pressure control valve regulates the supply air pressure to the set operating pressure and compensates pressure fluctuations. The filter bowl has a condensate drain valve.
The start-up valve/shutoff valve ventilates and vents the entire control. The 3/2-way valve is actuated by a rotary button.

Design	Sintered filter with water trap, piston regulator valve
Nominal flow rate*	1600 l/min
Input pressure	Maximum 1600 kPa (16 bar)
Working pressure	Maximum 1200 kPa (12 bar)
Grade of filtration	5 µm
Condensate quantity	43 cm^3
Connector	G 1/8, QS-6, for plastic tubing PUN 6 x 1

* Input pressure: 1000 kPa (10 bar), Operating pressure: 600 kPa (6 bar), Differential pressure: 100 kPa (1 bar).

Systainer | TP 101-1, TP 101-2, TP 101-3, TP 101-4 | Order no. 526 715

The practical delivery and storage box for all TP 101 partial equipment sets.

Internal dimensions (h x w x d)	124 x 377 x 277 mm

SPC 10-PLC cable | SoftStop | Order no. 648 607

(Not shown)

Supply cable for the SPC 10 end-position controller with 4 mm safety plugs.

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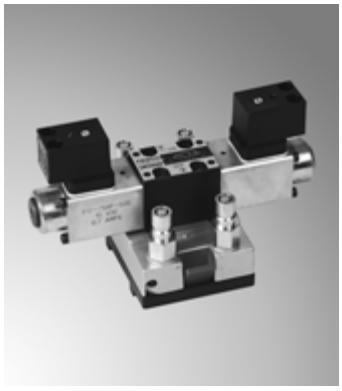
Training packages Hydraulics
Overview

Equipment sets with quality industrial components

The compact design of the elements allows a greater range with nominal size 4 (NG 4) allows a greater range of training and design of more complex circuits.
Naturally, with the patented Quick-Fix mounting system for quick and safe securing of components on the profile plate.



State-of-the-art coupling technology

Non-leaking couplings mean less pollution, thus protecting the environment:
– The quick coupling sockets are self-sealing when decoupled.
– A tight hydraulic connection can be established with the coupling nipple.
– During the coupling process, only the face of the couplings is coated with oil.

Study aids for every training package

Software, CBT, textbooks, collections of exercises and videos, each produced in many languages, create a pleasant learning environment for each training package.

Hydraulics, Basic Level TP 501

Hydraulics, Advanced Level TP 502

BIBB Hydraulics

Supplementary equipment sets

Electrohydraulics, Basic Level TP 601

Electrohydraulics, Advanced Level TP 602

Proportional hydraulics, Basic Level TP 701

Proportional hydraulics, Advanced Level TP 702

Closed-loop hydraulics, TP 511

Transparent models

Components

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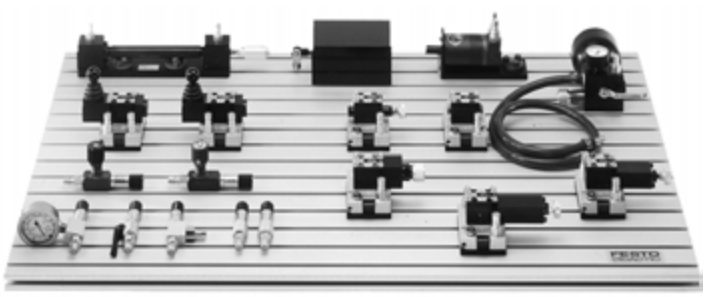
Training packages Hydraulics
Equipment sets

Hydraulics equipment set, Basic level TP 501



Training aims:
- Getting to know valves and devices
- Function and application of various valves and devices
- Measuring variables such as pressure, flow and time
- Calculation of surface ratio, force, output and speed
- Physical principles of hydraulics
- Applying basic hydraulic equations
- Using symbols (DIN/ISO 1219)
- Drawing displacement-steps diagrams
- Drawing hydraulic circuits
- Setup and commissioning of controls, including troubleshooting
- Basic hydraulic circuits such as pressure sequencing circuit, pump bypass, differential circuit, feed and return circuits, bypass circuits, counterbalancing and bypass with non-return valve

Recommended study media:
- Self-study program Fluid Studio® Hydraulics
- Design and simulation program FluidSIM® Hydraulics
- Measuring software Fluid Lab®-H
- Textbook Hydraulics, Basic level
- Workbook Hydraulics, Basic level
- Transparency set Hydraulics, Basic level
- Video Hydraulics, Basic level

(Please refer to chapter: Software and Courseware)
- Transparent models Hydraulics

(Please refer to chapter: Transparent models)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Hydraulic power unit
- 8 hose lines (Length 600 mm) (Order no. 152 960)
- 4 hose lines (Length 1000 mm) (Order no. 152 970)
- 4 hose lines (Length 1500 mm) (Order no. 159 386)
- Measuring set (Order no. 177 468)
- Pressure relief unit (Order no. 152 971)
- Cover for weight (Order no. 152 973)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Pressure gauge	3	152 841
Flow control valve	1	152 842
One-way flow control valve	1	152 843
Shut-off valve	1	152 844
Non-return valve 0.1 MPa	1	152 845
Non-return valve 0.5 MPa	1	152 846
T connector	7	152 847
Pressure relief valve/Pressure sequence valve	1	152 848
Pressure relief valve, piloted	1	152 849
3-way pressure reducing valve	1	152 850
2-way flow control valve	1	152 851
Non-return valve, delockable	1	152 852
Double-acting cylinder, 16/10/200	1	152 857
Hydraulic motor	1	152 858
Diaphragm accumulator with shut-off block	1	152 859
Weight	1	152 972
4/2-way hand lever valve	1	152 974
4/3-way hand lever valve, with recirculating mid-position	1	152 977
Equipment tray 1*	1	120 773
Equipment tray 2*	1	120 762
Equipment set, complete		**080 246**

(Technical data and description: Hydraulics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

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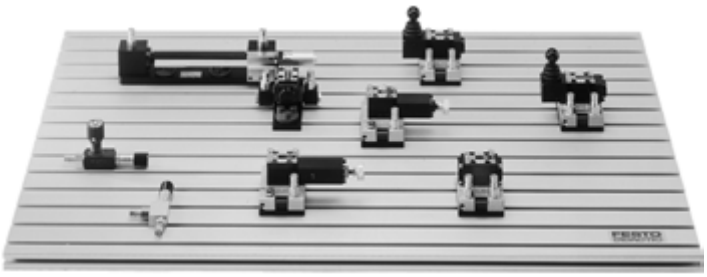
Training packages Hydraulics
Equipment sets

Hydraulics equipment set, Advanced level TP 502



Training aims:
- Hydraulic motor
- One-way restrictors and flow control valves for speed setting
- Pressure relief valves
- Fast traverse circuit
- Differential circuit
- Rectifier circuit
- Memory circuit
- Pressure sequencing circuit
- Pressure control valve
- 2/2-, 3/2-, 4/2- and 4/3- way valves
- Hydraulically delockable non-return valve
- One-way flow control valve
- Flow divider

Recommended study media:
- Self-study program Fluid Studio® Hydraulics
- Design and simulation program FluidSIM® Hydraulics
- Measuring software Fluid Lab®-H
- Workbook Hydraulics, Advanced level (Please refer to chapter: Software and Courseware)
- Transparent models Hydraulics (Please refer to chapter: Transparent models)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Hydraulic power unit
- 12 hose lines (Length 600 mm) (Order no. 152 960)
- 4 hose lines (Length 1000 mm) (Order no. 152 970)
- Measuring set (Order no. 177 468)
- Pressure relief unit (Order no. 152 971)
- Cover for weight (Order no. 152 973)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Assembly set for cylinder 16/10/200	1	120 778
One-way flow control valve	1	152 843
T connector	4	152 847
Pressure relief valve/Pressure sequence valve	1	152 848
Double-acting cylinder, 16/10/200	1	152 857
Flow dividing valve	1	152 967
Shut-off-/counterbalancing valve	1	152 968
4/3-way hand lever valve, with closed mid-position	1	152 975
4/3-way hand lever valve, with relieving mid-position	1	152 976
2/2-way stem-actuated valve	1	152 978
Equipment tray*	1	120 776
Equipment set, complete		**080 247**

(Technical data and description: Hydraulics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

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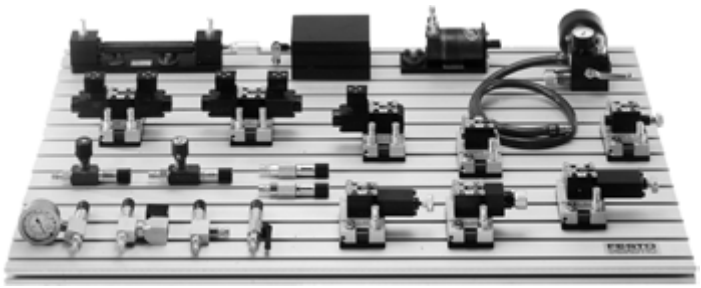
Training packages Hydraulics
Equipment sets

BIBB hydraulics equipment set, Exercises A - H



Training aims:
The fundamentals of hydraulic control engineering are taught based on 21 exercises. These training aims are divided in 8 different training units with the following contents:
– Power supply unit
– Way valves and drives
– Non-return valves
– Flow control valves
– Pressure valves and pressure switches
– Hydraulic accumulators
– Application circuits
– Commissioning and maintenance

The additional components (BIBB Hydraulics equipment set, additional exercises, Order no. 080 148) allows further interesting hydraulic exercises with the following content:
– Lifting a load
– Rectifier circuit
– Idling of pump output

Recommended study media:
– Self-study program Fluid Studio® Hydraulics
– Design and simulation program FluidSIM® Hydraulics
– Measuring software Fluid Lab®-H
– BIBB Hydraulics course
– BIBB Hydraulics transparent models (Please refer to chapter: Software and Courseware)
– Transparent models Hydraulics (Please refer to chapter: Transparent models)

Recommended accessories:
– Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
– Hydraulic power unit
– 9 hose lines (Length 600 mm) (Order no. 152 960)
– 2 hose lines (Length 1000 mm) (Order no. 152 970)
– Measuring set (Order no. 177 468)
– Pressure relief unit (Order no. 152 971)
– Cover for weight (Order no. 152 973)
– Tabletop power supply unit or power supply unit for the mounting frame

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Pressure gauge	3	152 841
Flow control valve	1	152 842
One-way flow control valve	1	152 843
Shut-off valve	1	152 844
Non-return valve 0.1 MPa	1	152 845
Non-return valve 0.5 MPa	1	152 846
T connector	4	152 847
Pressure relief valve/Pressure sequence valve	1	152 848
Pressure relief valve, piloted	1	152 849
3-way pressure reducing valve	1	152 850
2-way flow control valve	1	152 851
Non-return valve, delockable	1	152 852
Double-acting cylinder, 16/10/200	1	152 857
Hydraulic motor	1	152 858
Diaphragm accumulator with shut-off block	1	152 859
Weight	1	152 972
Pressure switch	1	167 080
4/2-way solenoid valve	1	167 082
4/3-way solenoid valve with closed mid-position	1	167 083
4/3-way solenoid valve with recirculating mid-position	1	167 085
Equipment tray*	1	120 761
Equipment set, complete		**080 147**
Non-return valve 0.1 MPa	1	152 845
Non-return valve 0.5 MPa	1	152 846
Pressure switch	1	167 080
4/3-way solenoid valve with relieving mid-position	1	167 084
BIBB hydraulics equipment set for additional exercises, complete		**080 148**

(Technical data and description: Hydraulics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

Preliminarie

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Supplementary equipment set from Electropneumatics, Basic level TP 201 to Electrohydraulics, Basic level TP 601

Training aims: see equipment set Electrohydraulics, Basic level TP 601.

Components	Quantity	Order no.
Pressure gauge	3	152 841
Non-return valve 0.1 MPa	1	152 845
T connector	8	152 847
2-way flow control valve	1	152 851
Double-acting cylinder, 16/10/200	1	152 857
Hydraulic motor	1	152 858
Weight	1	152 972
4/2-way solenoid valve	1	167 082
4/3-way solenoid valve with closed mid-position	1	167 083
Equipment tray*	1	120 774
Supplementary equipment set 1, complete		**378 542**
One-way flow control valve	1	152 843
Non-return valve 0.5 MPa	1	152 846
Pressure relief valve/Pressure sequence valve	2	152 848
Non-return valve, delockable	1	152 852
Relay, three-fold**	2	162 241
Limit switch, electrical, right-actuated	1	183 345
Equipment tray*	1	120 809
Supplementary equipment set 2, complete		**378 543**
Supplementary equipment set 1 and 2, complete		**167 103**

(Technical data and description: Hydraulics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

** Four plug-in adapters (Order no. 323 571) are required for securing components to the profile plate, see Accessories.

Supplementary equipment set from Hydraulics, Basic level TP 501 to Electrohydraulics, Basic level TP 601

Training aims: see equipment set Electrohydraulics, Basic level TP 601.

Components	Quantity	Order no.
T connector	1	152 847
Pressure relief valve/Pressure sequence valve	1	152 848
Relay, three-fold**	2	162 241
Signal input, electrical**	1	162 242
Indicator unit and distributor, electrical**	1	162 244
4/2-way solenoid valve	1	167 082
4/3-way solenoid valve with closed mid-position	1	167 083
Limit switch, electrical, left-actuated	2	183 322
Limit switch, electrical, right-actuated	2	183 345
Equipment tray*	1	120 807
Supplementary equipment set, complete		**167 104**

(Technical data and description: Hydraulics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

** Four plug-in adapters (Order no. 323 571) are required for securing components to the profile plate, see Accessories.

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Training packages Hydraulics
Equipment sets

Supplementary equipment set from Hydraulics, Basic level TP 501 and Advanced level TP 502 to Electrohydraulics, Basic level TP 601

Training aims: see equipment set Electrohydraulics, Basic level TP 601.

Components	Quantity	Order no.
Relay, three-fold**	2	162 241
Signal input, electrical**	1	162 242
Indicator unit and distributor, electrical**	1	162 244
4/2-way solenoid valve	1	167 082
4/3-way solenoid valve with closed mid-position	1	167 083
Limit switch, electrical, left-actuated	2	183 322
Limit switch, electrical, right-actuated	2	183 345
Supplementary equipment set, complete		**167 105**

(Technical data and description: Hydraulics chapter – Components)

** Four plug-in adapters (Order no. 323 571) are required for securing components to the profile plate, see Accessories.

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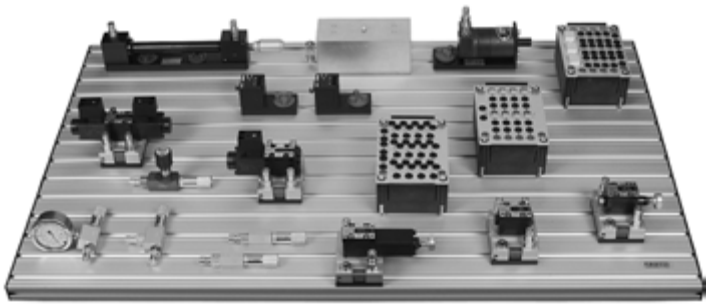
Electrohydraulics equipment set, Basic level TP 601



Training aims:
- Application and function of various valves and devices
- Electrical variables
- Using symbols (DIN/ISO 1219)
- Drawing displacement/step diagrams
- Drawing electrical and hydraulic circuit diagrams
- Setup and commissioning of controls, including troubleshooting
- Basic hydraulic circuits such as pressure sequencing circuit, pump bypass and differential circuit.

Recommended study media:
- Self-study program Fluid Studio® Hydraulics
- Design and simulation program FluidSIM® Hydraulics
- Measuring software Fluid Lab®-H
- Textbook Electrohydraulics, Basic level
- Workbook Electrohydraulics, Basic level
- Transparency set Hydraulics, Basic level
- Video Electropneumatics/ Electrohydraulics, Basic level

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Hydraulic power unit
- 8 hose lines (Length 600 mm) (Order no. 152 960)
- 8 hose lines (Length 1000 mm) (Order no. 152 970)
- 2 hose lines (Length 1500 mm) (Order no. 159 386)
- Measuring set (Order no. 177 468)
- Pressure relief unit (Order no. 152 971)
- Cover for weight (Order no. 152 973)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Pressure gauge	3	152 841
One-way flow control valve	1	152 843
Non-return valve 0.1 MPa	1	152 845
Non-return valve 0.5 MPa	1	152 846
T connector	8	152 847
Pressure relief valve/Pressure sequence valve	2	152 848
2-way flow control valve	1	152 851
Non-return valve, delockable	1	152 852
Double-acting cylinder, 16/10/200	1	152 857
Hydraulic motor	1	152 858
Weight	1	152 972
Relay, three-fold**	2	162 241
Signal input, electrical**	1	162 242
Indicator unit and distributor, electrical**	1	162 244
4/2-way solenoid valve	1	167 082
4/3-way solenoid valve with closed mid-position	1	167 083
Limit switch, electrical, left-actuated	2	183 322
Limit switch, electrical, right-actuated	2	183 345
Equipment tray 1*	1	120 774
Equipment tray 2*	1	120 775
Equipment set, complete		**184 463**

(Technical data and description: Hydraulics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

** Four plug-in adapters (Order no. 323 571) are required for securing components to the profile plate, see Accessories.

Note:

An additional pressure switch (Order no. 167 080) is required for exercises 5, 10 and 11 of the Workbook Electrohydraulics, Basic level.

A second cylinder (Order no. 152 857) is required for exercise 13.

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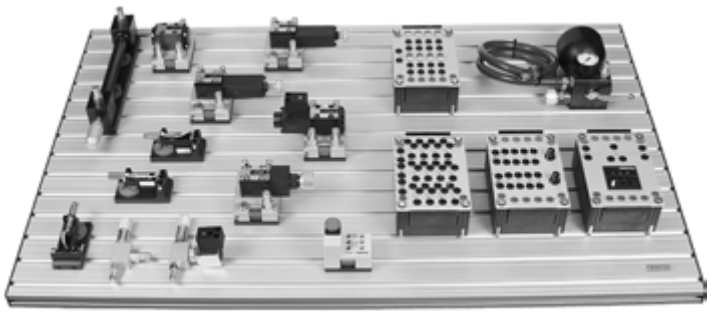
Training packages Hydraulics
Equipment sets

Electrohydraulics equipment set, Advanced level TP 602



Training aims:
- Rapid traverse feed circuit
- Rapid traverse feed circuit with counterbalancing
- Rapid traverse feed circuit with use of 2-way and 3-way flow control valves
- Non-deleting sequencer
- Pressureless tank bypass circuit
- Integration of an EMERGENCY OFF function
- Application of the flow divider
- Hydraulic speed-equalizing circuit
- Single cycle and continuous cycle
- Memory circuit
- Speed control
- Two-hand safety control

Recommended study media:
- Self-study program Fluid Studio® Hydraulics
- Design and simulation program FluidSIM® Hydraulics
- Measuring software Fluid Lab®-H
- Workbook Electrohydraulics, Advanced level

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Hydraulic power unit
- 10 hose lines (Length 600 mm) (Order no. 152 960)
- 4 hose lines (Length 1000 mm) (Order no. 152 970)
- 2 hose lines (Length 1500 mm) (Order no. 159 386)
- Measuring set (Order no. 177 468)
- Pressure relief unit (Order no. 152 971)
- Cover for weight (Order no. 152 973)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
T connector	4	152 847
Pressure relief valve, piloted	1	152 849
3-way pressure reducing valve	1	152 850
Double-acting cylinder, 16/10/200	1	152 857
Diaphragm accumulator with shut-off block	1	152 859
Flow dividing valve	1	152 967
Shut-off-/counterbalancing valve	1	152 968
Relay, three-fold**	2	162 241
Time relay, 2-fold**	1	162 243
Indicator unit and distributor, electrical**	1	162 244
Preset counter, electrical, incrementing**	1	162 355
Pressure switch	1	167 080
4/2-way solenoid valve	1	167 082
Proximity switch, inductive	1	178 574
Proximity switch, capacitive	1	178 575
Proximity switch, optical	1	178 577
EMERGENCY OFF pushbutton, electrical	1	183 347
Equipment tray*	1	120 766
Equipment set, complete		**184 464**

(Technical data and description: Hydraulics chapter – Components)

* The parts in the equipment set are delivered in a tray which may be used as a drawer in the workstation systems.

** Four plug-in adapters (Order no. 323 571) are required for securing components to the profile plate, see Accessories.

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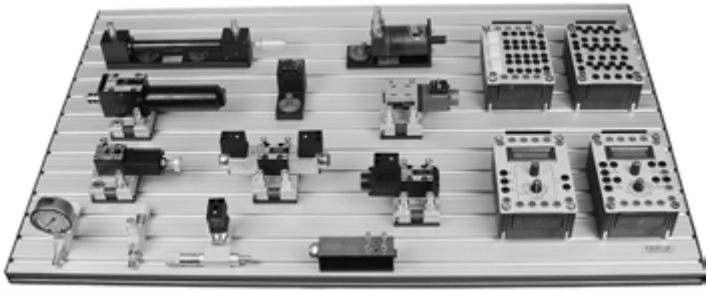
Training packages Hydraulics
Equipment sets

Proportional hydraulics equipment set, Basic level TP 701



Training aims:
- Proportional amplifier (basic flow, maximum flow, nominal values)
- Recording characteristics for the proportional discharge valve
- Application of the proportional pressure relief valve for setting the maximum system pressure
- Pump circuit
- Characteristics of the 4/3-way proportional valve
- Setting various speed profiles
- Feed/rapid traverse control
- EMERGENCY OFF circuit
- Pressure sequencing circuit

Recommended study media:
- Self-study program Fluid Studio® Hydraulics
- Design and simulation program FluidSIM® Hydraulics
- Measuring software Fluid Lab®-H
- Textbook Proportional hydraulics, Basic level
- Workbook Proportional hydraulics, Basic level
- Transparency set Proportional hydraulics, Basic level

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Hydraulic power unit
- 5 hose lines (Length 1000 mm) (Order no. 152 970)
- 2 hose lines (Length 1500 mm) (Order no. 159 386)
- Measuring set (Order no. 177 468)
- Pressure relief unit (Order no. 152 971)
- Cover for weight (Order no. 152 973)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Pressure gauge	2	152 841
Flow control valve	1	152 842
One-way flow control valve	1	152 843
T connector	2	152 847
Pressure relief valve/Pressure sequence valve	1	152 848
Double-acting cylinder, 16/10/200	1	152 857
Hydraulic motor	1	152 858
Pressure filter	1	152 969
Weight	1	152 972
Pressure balance (Proportional flow control valve)	1	159 351
Relay, three-fold**	1	162 241
Signal input, electrical**	1	162 242
Proportional amplifier**	1	162 255
Setpoint value card**	1	162 256
4/2-way solenoid valve	1	167 082
4/3-way proportional valve	1	167 086
Proportional pressure relief valve	1	167 087
Proximity switch, inductive	2	178 574
Equipment set, complete		**184 465**

(Technical data and description: Hydraulics chapter – Components)

** Four plug-in adapters (Order no. 323 571) are required for securing components to the profile plate, see Accessories.

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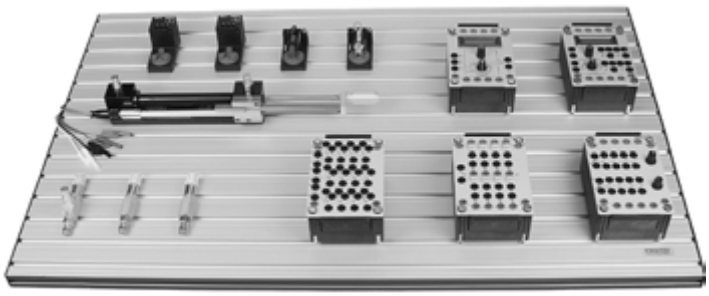
Training packages Hydraulics
Equipment sets

Proportional hydraulics equipment set, Advanced level TP 702



Training aims:
- Control of pressure and position
- Determining the displacement-voltage characteristic of the linear position encoder
- Functional description of a comparator card
- Controlling speed of hydraulic motor
- Reversal of a hydraulic motor
- Structure of various sequence controls: path-dependent, time-dependent, load-independent, pressure-dependent
- Establishing the pressure-voltage characteristic of a pressure sensor
- Developing a stroke speed and rotary speed control

Recommended study media:
- Self-study program Fluid Studio® Hydraulics
- Design and simulation program FluidSIM® Hydraulics
- Measuring software Fluid Lab®-H
- Workbook Proportional hydraulics, Advanced level

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Hydraulic power unit
- 5 hose lines (Length 600 mm) (Order no. 152 960)
- 1 hose line (Length 1500 mm) (Order no. 159 386)
- Measuring set (Order no. 177 468)
- Pressure relief unit (Order no. 152 971)
- Cover for weight (Order no. 152 973)
- Digital multimeter (Order no. 035 681)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Assembly set for cylinder 16/10/200	1	120 778
Non-return valve 0.1 MPa	1	152 845
T connector	1	152 847
Non-return valve, delockable	1	152 852
Relay, three-fold**	3	162 241
Time relay, 2-fold**	1	162 243
Indicator unit and distributor, electrical**	1	162 244
Setpoint value card**	1	162 256
Comparator**	1	162 257
Linear potentiometer	1	167 090
Proximity switch, capacitive	1	178 575
Proximity switch, optical	1	178 577
Limit switch, electrical, left-actuated	1	183 322
Limit switch, electrical, right-actuated	1	183 345
Equipment set, complete		**184 466**

(Technical data and description: Hydraulics chapter – Components)

** Four plug-in adapters (Order no. 323 571) are required for securing components to the profile plate, see Accessories.

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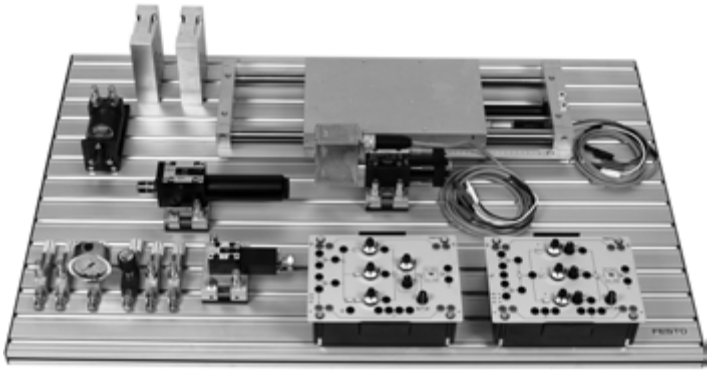
Closed-loop control hydraulics equipment set, TP 511



Training aims:
- Recording the characteristics of pressure sensors and position encoders and of the control valve
- Measuring and calculating characteristic values of the control system
- Modifying the control system with greater volume and additional mass
- Characteristic values of control elements such as P, I and D controllers and their combinations, and of status controllers
- Setup of a control circuit with setting of control quality, empirical parameterization
- Measuring and calculation of contouring error
- Influence of disturbance variables such as pressure loss and leakage
- Influence of an active, braking load

Recommended study media:
- Self-study program Fluid Studio® Hydraulics
- Design and simulation program FluidSIM® Hydraulics
- Measuring software Fluid Lab®-H
- Workbook Closed-loop control hydraulics

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Hydraulic power unit
- 7 hose lines (1000 mm) (Order no. 152 970)
- 4 hose lines (1500 mm) (Order no. 159 386)
- 2 hose lines (3000 mm) (Order no. 158 352)
- Measuring set (Order no. 177 468)
- Digital multimeter (Order no. 035 681)
- Brake cylinder (Order no. 152 295)
- Function generator (Order no. 152 918)
- 3 BNC-4 mm cables (Order no. 152 919)
- BNC-BNC cable (Order no. 158 357)
- T connector for BNC (Order no. 159 298)
- Oscilloscope (Order no. 152 917)
- Pressure relief unit (Order no. 152 971)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Pressure gauge	1	152 841
Flow control valve	1	152 842
T connector	4	152 847
Pressure relief valve/Pressure sequence valve	1	152 848
Hydraulic motor	1	152 858
Pressure filter	1	152 969
Complete partial equipment set, control hydraulics, general		**091 070**
PID controller**	1	162 254
4/3-way control valve	1	167 088
Complete partial equipment set, control hydraulics, pressure control		**184 472**
Weight	2	034 065
Status controller**	1	162 253
Linear unit, 200 mm stroke	1	167 089
Complete partial equipment set, position control		**184 473**
Complete equipment set control hydraulics		**184 471**

(Technical data and description: Hydraulics chapter – Components)

** Four plug-in adapters (Order no. 323 571) are required for securing components to the profile plate, see Accessories.

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Training packages Hydraulics
Transparent Models

The technical data shown in the column to the right applies generally to all following components:

Size _____ NG 6
Maximum operating pressure _____ 1000 kPa (10 bar)
Housing material _____ Acrylic glass
Medium _____ Hydraulic oil

Set of transparent models for basic level

Comprising the following 14 models.

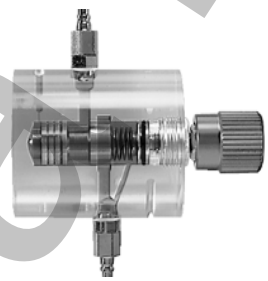
Order no. 011 738

Pressure relief valve, directly controlled, poppet principle

Order no. 011 721

Pressure relief valve, directly controlled, slide principle

Order no. 011 722



Pressure reduction valve

Order no. 011 724

Flow control valve

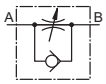
Order no. 011 717

Orifice valve

Order no. 011 718

One-way flow control valve

Order no. 011 719



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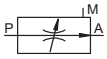
2-way flow control valve with measuring connection

Order no. 011 720

Non-return valve

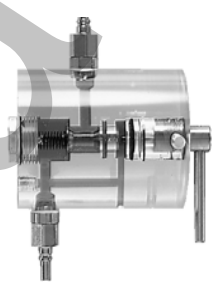
Order no. 011 729

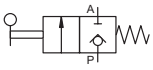
Non-return valve, piloted

Order no. 011 730

2/2-way valve, poppet principle

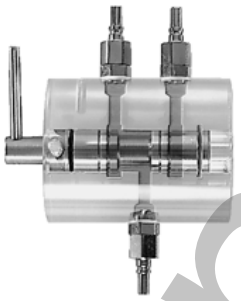
Order no. 011 725

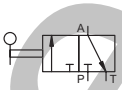




3/2-way valve

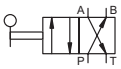
Order no. 011 726





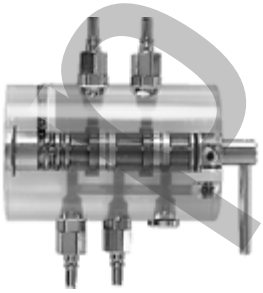
4/2-way valve

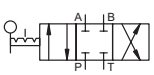
Order no. 011 727



4/3-way valve, mid position closed

Order no. 011 728





Cylinder, double-acting

Order no. 011 731

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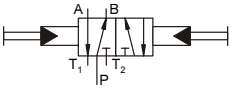
Training packages Hydraulics
Transparent Models

Optional transparent models for advanced training

Please select from the following 19 models.

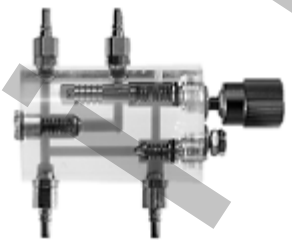
5/2-way valve, pilot-actuated

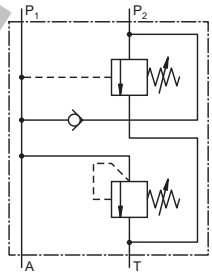
Order no. 013 394



Shut-off circuit

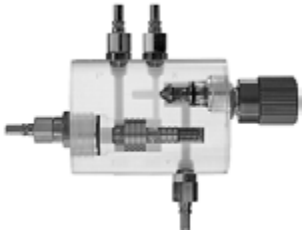
Order no. 013 395

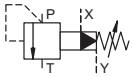




Pressure relief valve, piloted

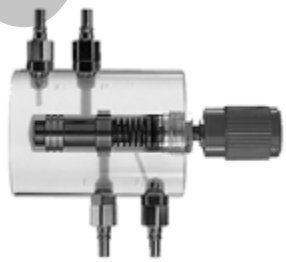
Order no. 011 723

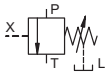




Pressure relief valve, externally actuated

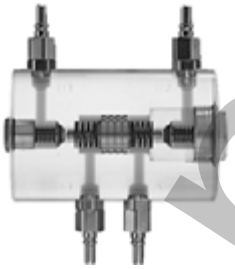
Order no. 013 396

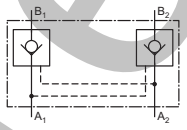




Twin non-return valve, delockable

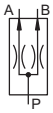
Order no. 013 397





Flow dividing valve

Order no. 013 402



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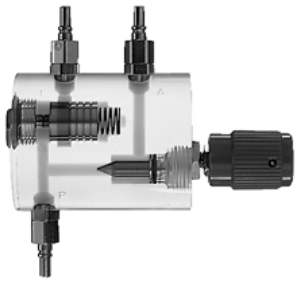
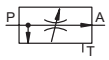
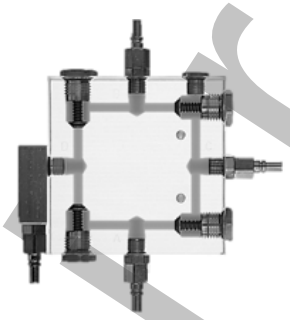
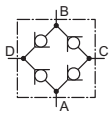
3-way flow control valve Order no. 013 403



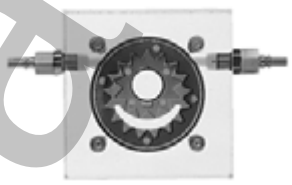
Rectifier circuit Order no. 013 405





Vane motor Order no. 013 398

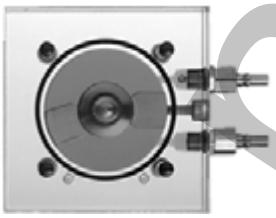
Internal gear motor Order no. 013 399



External gear motor Order no. 013 406

Swivel motor (rack and pinion) Order no. 013 400

Swivel motor (rotary vane) Order no. 013 401



Axial piston motor Order no. 013 404

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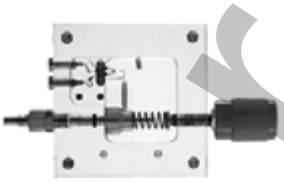
Overpressure gauge Order no. 013 407

Pressure switch Order no. 013 411



Piston accumulator Order no. 013 408

Diaphragm accumulator Order no. 013 409

Bladder accumulator Order no. 013 410

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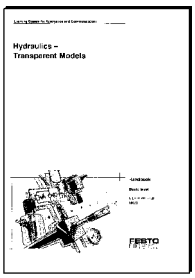
Transparent Models

Hydraulics – Transparent Models, Basic level



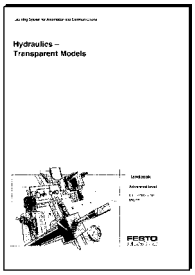
Manual

This book explains the function and design of the individual transparent models. Each model is shown as a cut-away drawing and a symbol in accordance with DIN/ISO 1219, together with notes on the connection and actuation of each model. The descriptions cover orifices, flow control valve, pressure regulator, pressure relief valve, directional control valve, non-return valve and double-acting cylinder.

T. Ocker
Edition 1992, 36 pages, looseleaf

Order no. 080 230 (German)
Order no. 080 231 (English)
Order no. 094 437 (Spanish)

Hydraulics – Transparent Models, Optional models



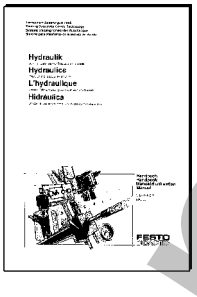
Manual

This book explains the function and design of the individual transparent models. Each model is shown as a cut-away drawing and a symbol in accordance with DIN/ISO 1219, together with notes on the connection and actuation of each model. The descriptions cover pilot-actuated pressure relief valve, piloted directional control valves, various motors and types of accumulators.

J. Mayer, D. Merkle, T. Ocker
Edition 1992, 48 pages, looseleaf

Order no. 080 235 (German)
Order no. 080 236 (English)
Order no. 094 438 (Spanish)

Power supply unit for hydraulic, transparent models



Manual

This provides operating instructions for the power supply unit for the hydraulic transparent models, with an explanation of its mode of operation and possible applications.

D. Merkle
Edition 1989, 26 pages, bound

Order no. 080 220
(German, English, French, Spanish)

Power supply unit with set of hoses

Accessories

The power supply unit allows all the functions of the transparent models to be demonstrated. The connections on the function module of the power supply unit and the transparent models are clearly marked. Self-closing quick coupling connectors ensure safe and clean handling.

Oil reservoir	5.6 dm^3 (l)
Filling level	5 dm^3 (l)
Medium	Hydraulic oil, ISO-VG32, HL or HLP
Electric motor	230 V, 50 Hz, 600 – 4000 min^{-1}
Connecting lead	Approx. 2.5 m
Maximum operating pressure	1000 kPa (10 bar)
Dimensions (L x W x H)	475 x 235 x 171 mm
Weight	Approx. 11 kg with oil

Order no. 030 303

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Training packages Hydraulics
Transparent Models

Overhead projector
Geha top vision 2400

Accessories

This overhead projector has all the features normally only found in high-end equipment:
– Patented hinged column – for convenient transport
– Uniform illumination and impressive images in all classrooms and conference rooms.
– Built-in lamp changer
– Simple handling

Lamp/service life	Low-voltage halogen lamp 36 V/400 W/50 h
Light intensity	Approx. 4000 Lumen
Economy setting	Approx. -10 %
Lens	3-element, f = 315 mm
Dimensions without column (W x D x H)	380 x 360 x 270 mm
Weight	12 kg

Mains connection	230 V AC (50 Hz)
suitable for DE, FR, NO, SE, FI, PT, ES, AT, NL, BE, GR, TR, IT, DK, IR, ID	Order no. 158 356
Mains connection	110 V AC (60 Hz)
suitable for US, CA, Mittelamerika, BR, CO, YU, EC, KR, TW, TH, PH, JP	Order no. 527 513

Plexiglass model support

Accessories

Order no. 011 735

The plexiglass model support is placed on an overhead projector. Various transparent models can then be mounted on it for demonstration purposes.

Format	DIN A 4

Oil dye

Accessories

Order no. 110 672

(Not shown)

Hydraulic oil is dyed with oil dye for more effective demonstration of physical properties.

Transparent models organizer

Accessories

(Not shown)

The organizer ensures neat and structured storage of transparent models. The organizer can be integrated into lab furniture.

For Transparent models, Basic level	Order no. 159 329
For Transparent models, Optional	Order no. 159 330

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The technical data indicated here applies to all components (unless otherwise stated):

Hydraulic connection _____ NG 4
Hydraulic medium _____ Mineral oil, 22 cST (mm^2/s) recommended
Electrical connection _____ 4 mm safety sockets or safety plugs
Voltage supply _____ 24 V DC

The components for mounting on the support frame can alternatively be mounted on the profile plate with the aid of four plug-in adapters (Order no. 323 571, see Accessories chapter).

Weight

TP 111, TP 511

Order no. 034 065

m

Weight with two cylinder screws. Four recessed grips facilitate handling. The weight is used for loading tests on the linear drives.

Mass _____ 5 kg
Length _____ 150 mm
Width _____ 110 mm
Height _____ 40 mm
Mounting method _____ 2 cheese-head screws M5

Assembly set for cylinder 16/10/200 (Order no. 152 857)

TP 502, TP 702

Order no. 120 778

This assembly set allows mounting of the guide ruler to actuate the control cam of the 2/2-way stem-actuated valve (Order no. 152 978).
This assembly set also allows the mounting of a linear potentiometer (Order no. 167 090, measuring stroke 200 mm).

Length of ruler _____ 200 mm
Division in mm _____ 150 : 50

For further assembly sets for the optional cylinders 16/10/300 und 25/18/200, please see the Accessories chapter.

Pressure gauge

TP 501, BIBB-H, TP 601, TP 701, TP 511

Order no. 152 841

The pressure gauge is protected by a glycerin filling against pressure peaks, condensed water and the ingress of water during cleaning.

Order no. _____ 0 – 10 MPa (0 – 100 bar)
Accuracy _____ 1.6 % of full-scale value
Operating pressure, static _____ 3/4 of full-scale value
Operating pressure, dynamic _____ 2/3 of full-scale value
Actuation _____ Hydraulic

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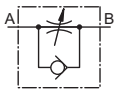
Training packages Hydraulics
Components

Flow control valve — TP 501, BIBB-H, TP 701, TP 511 — Order no. 152 842

Nominal flow rate _____ 9 l/min
Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Actuation _____ Manual

One-way flow control valve — TP 501, TP 502, BIBB-H, TP 601, TP 701 — Order no. 152 843



Nominal flow rate _____ 9 l/min
Opening pressure _____ 70 kPa (0.7 bar)
Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Actuation _____ Manual

Shut-off valve — TP 501, BIBB-H — Order no. 152 844

Shut-off valve with two ports. The valve can be inserted at any point to enable shut-off of flow.

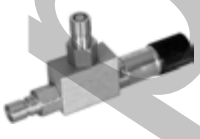
Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Actuation _____ Manual

Non-return valve 0.1 MPa/0.5 MPa — TP 501, TP 502, BIBB-H, TP 601, TP 702

Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Actuation _____ Hydraulic

Opening pressure _____ 0.1 MPa (1bar) — Order no. 152 845
Opening pressure _____ 0.5 MPa (5 bar) — Order no. 152 846

Branch tee — TP 501, TP 502, BIBB-H, TP 601, TP 602, TP 702, TP 511 — Order no. 152 847



Branch tee with thee conenctions (1 socket, 2 nipples). The branch tee can be inserted at any point to create a branch.

Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)

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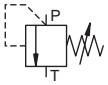
Pressure relief valve,
Pressure sequence valve

TP 501, TP 502, BIBB-H, TP 601, TP 701, TP 511

Order no. 152 848



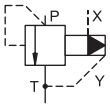
The valve is used as a pressure relief valve if port T is connected to the tank and as a pressure sequence valve if port T is connected to another power component, such as a cylinder.

Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Adjustment _____ Manual
Actuation _____ Hydraulic

Pressure relief valve, piloted

TP 501, BIBB-H, TP 602

Order no. 152 849

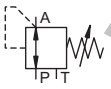


Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Adjustment _____ Manual
Actuation _____ Hydraulic

3-way pressure reducing valve

TP 501, BIBB-H, TP 602

Order no. 152 850

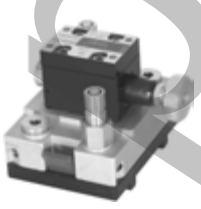
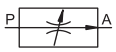


Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Adjustment _____ Manual
Actuation _____ Hydraulic

2-way flow control valve

TP 501, BIBB-H, TP 601

Order no. 152 851



Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Adjustment _____ Manual
Actuation _____ Hydraulic

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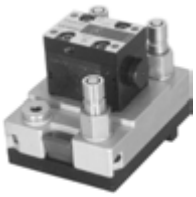
Components

Non-return valve, delockable | TP 501, BIBB-H, TP 601 | Order no. 152 852



The valve body is a single + double pilot-operated non-return valve or check valve. By screwing in a coupling nipple (Order no. 342 047) the function can be changed to a single-pilot delockable double non-return valve.

Surface ratio of pilot piston
to non-return valve seat _____ 3.3 : 1
Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)

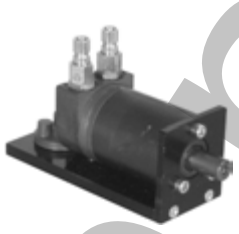
Double-acting cylinder, 16/10/200 | TP 501, TP 502, BIBB-H, TP 601, TP 602, TP 701 | Order no. 152 857

Double-acting cylinder with control cam and two barbed fittings. If the cylinder is used with the weight (Order no. 152 972), it must be ensured that the cylinder is properly tightened. A cover (Order no. 152 973) further enhances safety.
Matching potentiometer: Order no. 167 090. This potentiometer is mounted on the cylinder with the mounting kit (Order no. 120 778).

Piston diameter _____ 16 mm
Piston rod diameter _____ 10 mm, with M8 thread
Stroke _____ 200 mm
Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)

Further cylinder designs (see Accessories chapter):
Double-acting cylinder, 16/10/300 mm
Double-acting cylinder, 16/10/400 mm
Double-acting cylinder, 25/18/200 mm

Hydraulic motor | TP 501, BIBB-H, TP 601, TP 701, TP 511 | Order no. 152 858



Design _____ Orbit
Geometric displacement _____ 8.2 cm^3
Max. permissible pressure
in return line _____ $p_{R\ max}$ 5 MPa (50 bar)
Max. rotary speed n_{max} _____ 1950 min^{-1}
Output shaft with spring _____ Ø 16 x 28, A5 x 5 DIN 6885
Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)

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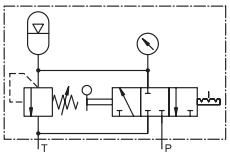
Diaphragm accumulator with shut-off block

TP 501, BIBB-H, TP 602

Order no. 152 859



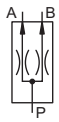
The pressure relief valve protects the accumulator from overpressure. The gas filling pressure of the accumulator can be measured and changed at the gas valve with the help of the filling and testing device (Order no. 092 491).
Fill the accumulator with nitrogen only.

Gas	Nitrogen
Gas filling pressure as supplied p_0	1 MPa (10 bar)
Max. permissible pressure p_{max}	12 MPa (120 bar)
Nominal volume	0.32 dm^3
Adjustment	Manual
Actuation	Hydraulic

Flow dividing valve

TP 502, TP 602

Order no. 152 967

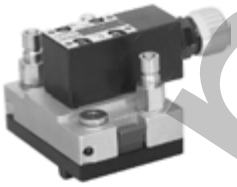


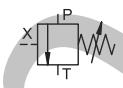
Operating pressure p	6 MPa (60 bar)
Max. permissible pressure p_{max}	12 MPa (120 bar)
Actuation	Hydraulic

Shut-off/counterbalancing valve

TP 502, TP 602

Order no. 152 968





Operating pressure p	6 MPa (60 bar)
Max. permissible pressure p_{max}	12 MPa (120 bar)
Adjustment	Manual
Actuation	Hydraulic

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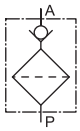
Training packages Hydraulics
Components

Pressure filter | TP 701, TP 511 | Order no. 152 969

Mesh size _____ 5 µm

Spare cartridge for pressure filter — Order no. 236 302



Weight | TP 501, BIBB-H, TP 601, TP 701 | Order no. 152 972

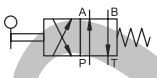
m

The weight is for loading of the cylinder and simulates a driving or tractive load. The weight can only be used vertically with a double-acting cylinder (Order no. 152 857). For this purpose, the cylinder and the weight are mounted on the column of the Learnline trolley. In the case of a horizontal profile plate, the weight is mounted on the mounting profile (Order no. 119 352). In the case of the Econo-myline furniture with inclined boards, an additional mounting kit (Order no. 526 847) is required. The cover (Order no. 152 973) further enhances safety.

Mass _____ 9 kg
Dimensions, L x W x H _____ 150 x 100 x 80 mm

4/2-way hand lever valve | TP 501 | Order no. 152 974

Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Actuation _____ Manual



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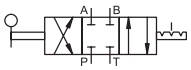
4/3-way hand lever valve with closed mid-position

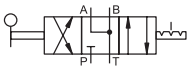
TP 502 — Order no. 152 975



Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Actuation _____ Manual

4/3-way hand lever valve with relieving mid-position

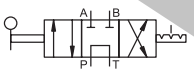
TP 502 — Order no. 152 976



Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Actuation _____ Manual

4/3-way hand lever valve with recirculating mid-position

TP 501 — Order no. 152 977



Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Actuation _____ Manual

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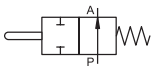
Training packages Hydraulics
Components

2/2-way stem-actuated valve

TP 502

Order no. 152 978



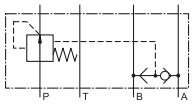
The valve is operated on the hydraulic cylinder (Order no. 152 857, 184 489 or 184 490).
The assembly set is also required (Order no. 120 778, 525 952 or 525 955).

Operating pressure p _____ 6 MPa (60 bar)
Max. permissible pressure p_{max} _____ 12 MPa (120 bar)
Actuation _____ Mechanical

Pressure balance
(Proportional flow control valve)

TP 701

Order no. 159 351



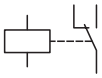
The pressure balance is the combination of two valves – namely a shuttle valve and a pressure relief valve. The pressure balance is installed between the way valve and the baseplate. In conjunction with the 4/3-way proportional valve, a proportional flow control valve results.

Valve design _____ Sandwich-construction cartridge valve
Port pattern, hydraulic _____ ISO/DIN 4401 size 02
Nominal pressure drop _____ 1 MPa (10 bar)
Nominal flow rate q_N _____ 8 l/min

Relay, three-fold

TP 201, TP 202, BIBB-EP, TP 601, TP 602, TP 701, TP 702

Order no. 162 241



The device has three relays with terminals and two buses for power supply.

Contact set _____ 4 change-over switch
Contact load _____ Maximum 5 A
Cut-off load _____ Maximum 90 W
Pick-up time _____ 10 ms
Drop-off time _____ 8 ms

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Signal input, electrical

TP 201, TP 202, BIBB-EP, TP 111, TP 601, TP 701, TP 301

Order no. 162 242

The device contains an illuminated pushbutton switch (control switch) and two illuminated pushbuttons (momentary contact switches) with terminals and two buses for power supply.

Contact set _____ 2 makes, 2 breaks
Contact load _____ Maximum 1 A
Power consumption (Miniature bulb) _____ 0.48 W

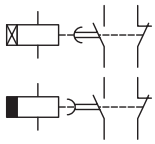
Time relay, two-fold

TP 202, BIBB-EP, TP 602, TP 702

Order no. 162 243

The element contains a release-delay and a pickup-delay time relay. Both relays are infinitely variable, using the rotary knob of the potentiometer.

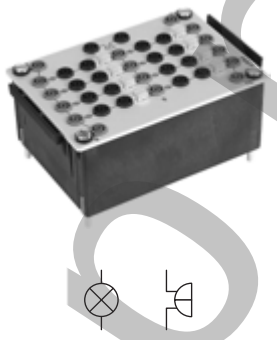
Contact set _____ 2 makes, 2 breaks
Contact load _____ Maximum 5 A
Cut-off load _____ Maximum 100 W
Delay _____ 0.5 – 10 s adjustable



Indicator unit and distributor, electrical

TP 201, BIBB-EP, TP 601, TP 602, TP 702, TP 301

Order no. 162 244



The device contains an acoustic indicator and four lamps with terminals and three buses for power supply. Through-contact socket pairs per lamp allow the element to also be used as a distributor.

Power consumption acoustic indicator ____ 0.04 W
Power consumption indicator lamps _____ 1.2 W
Frequency acoustic indicator _____ 420 Hz

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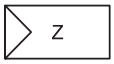
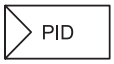
Training packages Hydraulics
Components

Status controller/PID controller TP 111, TP 511



The controller comprises the following:
– Voltage supply
– Differential inputs
– Comparators
– Final control elements:
positional control elements, speed control elements, acceleration control elements (status controller), proportional control elements, integral control elements, differential control elements (PID controller)
– Overall gain (Status controller)
– Correcting variable offset
– Summing junction
– Limiter
– Output



Overmodulation indicator	-10 > Ue > +10 V
Input voltage range	-13 – +13 V
Output voltage limitation	[0 – +10 V] [-10 – +10 V]
Correcting variable offset	5 ±3.5 V at [0 – +10 V] 0 ±7 V at [-10 – +10 V]

Position coefficient Kx	0 – 10 (status controller)
Speed coefficient Kx	0 – 100 ms (status controller)
Acceleration coefficient Kx	0 – 10 s^2 (status controller)
Overall gain P	0 – 1000 (status controller)

Proportional coefficient KP	0 – 1000 (PID controller)
Integral coefficient KI	0 – 1000 s^{-1} (PID controller
Differential coefficient KD	0 – 1000 ms (PID controller)

Status controller	Order no. 162 253
PID controller	Order no. 162 254

Proportional amplifier TP 701 Order no. 162 255

The amplifier allows control of proportional valves. It is designed so that it can either be driven by two independent solenoids (1 channel) or a valve with two solenoids (2 channel) such as a 4/3-way proportional valve. The proportional amplifier thus works either as a 1-channel amplifier or a 2-channel amplifier.

Setpoint values	±10 V DC in steps of 100 mV
Switching signal for internal setpoint values	15 – 30 V DC
Solenoid outputs	PWM signal, 24 V, max. 1 A
Enabling switching signal	15 – 30 V DC
Basic current	0 – 250 mA, in steps of 1 mA
Jump current	0 – 250 mA, in steps of 1 mA
Maximum current	100 mA – 1 A, in steps of 5 mA
Dither frequency	100 – 250 Hz, in steps of 1 Hz

The inputs are short-circuit protected or surge-proof up to 24 V.

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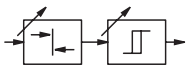
Setpoint value card | TP 701, TP 702 | Order no. 162 256

The setpoint value card has the following functions:
– Programmable setpoint generation
– Programmable ramp generation
– Cyclical sequencing of setpoints and ramps
– Stopwatch

Number of setpoint values	8
Output voltage range	-10 – +10 V tol. ±5 mV (adjustable in steps of 0.1 V)
Number of ramps	4
Ramp times	0 – 10.0 s/1 V (adjustable in steps of 50 ms/1 V)
Activating voltage of inputs	Min. 15 V
Output rate	1 kHz
Stop watch	Input 1, measuring time 0 – 100 hrs.

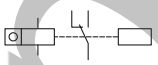
Comparator | TP 111, TP 702 | Order no. 162 257



Positive switching comparator with hysteresis. The inputs are short-circuit-proof or surge-proof to 24 V. 2 separate inputs (IN A, IN B) each acting on two independent comparators. Each comparator can be set to: Reference voltage (-10 – +10 V), Hysteresis (0 – +5 V).

Input voltage, (inputs A and B)	-10 – +10 V
Input resistance (inputs A and B)	>10 kΩ
Display accuracy	±30 mV
Outputs A and B	Floating relay contacts, changeover contacts
Contact load	24 V DC/2 A and 120 V AC/1 A

Preset counter, electrical, incrementing | TP 202, TP 602 | Order no. 162 355



Electrical preset counter, with terminals and two buses for power supply.

Contact set	1 change-over
Contact load	Maximum 1 A
Power consumption	2.4 W
Counter pulse	Minimum 20 ms
Display	3-character

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Training packages Hydraulics
Components

Pressure switch | BIBB-H, TP 602 | Order no. 167 080

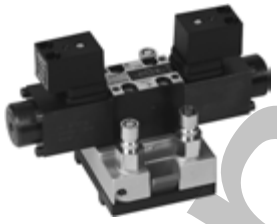
The branch tee with integrated pressure switch can be inserted into the hydraulic circuit at any point or added near a measuring point.

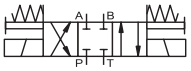
Pressure switch	Diaphragm switch
Operating pressure p	1 – 7 MPa (10 – 70 bar)
Hysteresis	~15 %
Continuous load rating	Maximum 2 A
Adjustment	Manual, using 2.5 mm Allen key
Actuation	Hydraulic

4/2-way solenoid valve | BIBB-H, TP 601, TP 602, TP 701 | Order no. 167 082

Power rating	12 W
Operating pressure p	6 MPa (60 bar)
Max. permissible pressure p_{max}	12 MPa (120 bar)
Actuation	Electrical

4/3-way solenoid valve, with closed mid-position | BIBB-H, TP 601 | Order no. 167 083





Power rating	12 W
Operating pressure p	6 MPa (60 bar)
Max. permissible pressure p_{max}	12 MPa (120 bar)
Actuation	Electrical

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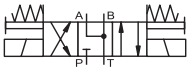
4/3-way solenoid valve with relieving mid-position

BIBB-H

Order no. 167 084

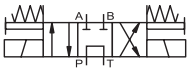


Power rating	12 W
Operating pressure p	6 MPa (60 bar)
Max. permissible pressure p_{max}	12 MPa (120 bar)
Actuation	Electrical

4/3-way solenoid valve with recirculating mid-position

BIBB-H

Order no. 167 085

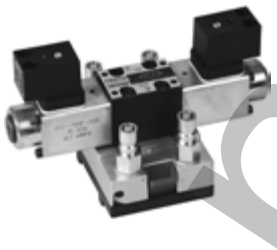


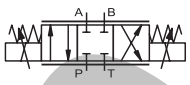
Power rating	12 W
Operating pressure p	6 MPa (60 bar)
Max. permissible pressure p_{max}	12 MPa (120 bar)
Actuation	Electrical

4/3-way proportional valve

TP 701

Order no. 167 086





Valve design	Directly actuated spool valve
Actuation	Proportional solenoid, pressure-tight, pushing
Port pattern, hydraulic	ISO/DIN 4401 size 02
Recommended grade of filtration	10 µm
Nominal flow rate q_N	1.5 l/min, at dp_N = 5 bar/control edge
Nominal current	680 mA

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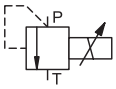
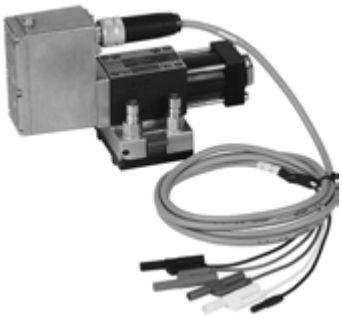
Training packages Hydraulics
Components

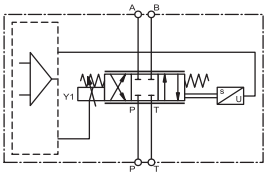
Proportional pressure relief valve — TP 701 — Order no. 167 087



Valve design	Directly actuated conical-seat poppet valve
Actuation	Proportional solenoid, pressure-tight, pushing
Port pattern, hydraulic	ISO/DIN 4401 size 02
Recommended grade of filtration	10 µm
Setting pressure	6 MPa at 600 mA and 2 l/min
Nominal flow rate q_N	8 l/min
Nominal current	800 mA
Resolution	<1 mA
Setting time of signal jump 0 – 100%	<60 ms
Repetition accuracy	<1 %

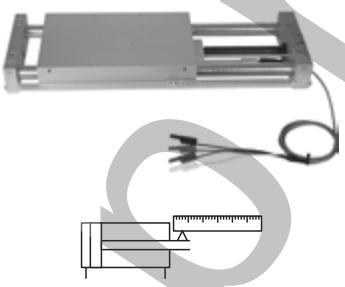
4/3-way regulating valve — TP 511 — Order no. 167 088





Valve design	Spool valve, single-stage with control sleeve
Actuation	Direct with permanent magnet-linear motor
Port pattern DIN 24340/ISO 4401/Cetop	Form A6/Cetop 3
Nominal flow rate q_N	
at Δp_N = 35 bar	5 l/min, tolerance ±10 %
at Δp_N = 5 bar	2 l/min, tolerance ±10 %
Max. operating pressure p_{max} static	Connections P, A, B: 120 bar Connection T: 50 bar
Operating voltage supply of integrated electronics	+24 V DC
IB_{max}	1.2 A
Setpoint value signal	±10 V DC
Actual value signal	2 – 10V
Manipulating time signal step 0 – 100%	<12 ms
Recommended grade of filtration	x < 6 (6 µm absolute)
Permissible grade of filtration	x < 10 (10µm absolute)

Linear drive, 200 mm stroke — TP 511 — Order no. 167 089



The weight (Order no. 034 065) or counterpressure cylinder (Order no. 120 779) can be used as an additional load for the linear drive.

Length	625 mm
Width	200 mm
Stroke	200 mm
Slide unit	15.7 kg
Cylinder	16 x 10 x 200 mm
Loads	max. 50 kg
Design of displacement encoder, electrical	Potentiometer with 200 mm measured length, impedance converter and connecting cable
Supply voltage	13 – 30 V
Output voltage	0 – 10 V

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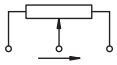
Linear potentiometer, 200 mm stroke | **TP 702** | Order no. 167 090



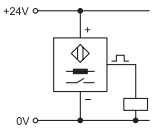
Position encoder. Mounting on the hydraulic cylinder (Order no. 152 857 or 184 490) requires the assembly set (Order no. 120 778 or 525 955).
For further linear potentiometers with stroke of 300 mm or 400 mm: see Accessories chapter.

Connection cable:
Supply voltage _____ 13 – 30 V DC
Output voltage _____ 0 – 10 V DC

Potentiometer:
Measuring stroke _____ 200 mm
Mechanical stroke _____ 201 mm

Mechanical attachment
of connecting rod _____ Thread M 4

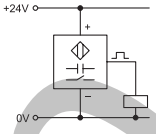
Proximity switch, inductive | TP 202, BIBB-EP, TP 602, TP 701, TP 301 | Order no. 178 574



Proximity switch that detects the proximity of electrically conducting objects through a change in inductance and emits a signal. The proximity switch has a PNP output and is designed as a normally-open contact. A yellow LED indicates the status. The switch is protected against polarity reversal, overload and short-circuit.

Switching voltage _____ 10 – 30 V DC
Nominal switching distance _____ 4 mm (material S 235 JR)
Switching frequency _____ Maximum 800 Hz
Output function _____ Normally open contact, positive switching
Output current _____ Maximum 400 mA

Proximity switch, capacitive | TP 202, BIBB-EP, TP 602, TP 702, TP 301 | Order no. 178 575



Proximity sensor that detects the presence of any object by a change in capacitance and emits a signal. The proximity switch has a PNP output and is designed as a normally-open contact. A yellow LED indicates the status. The switch is protected against polarity reversal, overload and short-circuit.

Switching voltage _____ 10 – 30 V DC
Nominal switching distance _____ 4 mm
Switching frequency _____ Maximum 100 Hz
Output function _____ Normally open contact, positive switching
Output current _____ Maximum 200 mA

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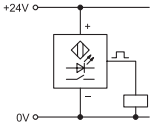
Training packages Hydraulics
Components

Proximity switch, optical

TP 202, BIBB-EP, TP 602, TP 702, TP 301

Order no. 178 577



Proximity switch that responds to light signals and delivers an electrical signal. The switching distance can be adjusted by means of a potentiometer. The proximity switch has a PNP output and is designed as a normally-open contact. A yellow LED indicates the status. The switch is protected against polarity reversal, overload and short-circuit.

Switching voltage	10 – 30 V DC
Nominal switching distance	0 – 100 mm (adjustable)
Switching frequency	Maximum 200 Hz
Output function	Normally open contact, positive switching
Output current	Maximum 100 mA

Limit switch, electrical, left-actuated

TP 201, BIBB-EP, TP 601, TP 702

Order no. 183 322

The electrical limit switch comprises a mechanically operated microswitch. When the roller lever is pressed – for example by the control cam of a cylinder – the microswitch is actuated. The circuit is closed or opened via the contacts. The microswitch can be wired as a normally-open, normally-closed or changeover contact.

Contact load	Maximum 5 A
Switching frequency	Maximum 200 Hz
Reproducible accuracy	0.2 mm
Switch travel	2.7 mm
Actuator force	5 N

Right-actuated

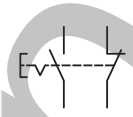
TP 201

Order no. 183 345

EMERGENCY OFF pushbutton, electrical

TP 202, PneuPos, SoftStop, TP 602

Order no. 183 347



EMERGENCY OFF pushbutton, consisting of an illuminated mushroom-head emergency button and a contact set with 1 make and 1 break. Accommodated in yellow plastic housing.

Actuator	Mushroom-head key with detent ring
Contact set	1 make, 1 break
Contact load limit	Maximum 8 A

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Training packages Sensors
Overview

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Proximity sensors,
FP 1110

Sensors for distance and displacement,
FP 1120

Sensors for force and pressure,
FP 1130

Components

Mounting systems as required

Components are mounted fast and clearly on the universal profile plate. Some components can also be mounted on the slotted mounting plate.

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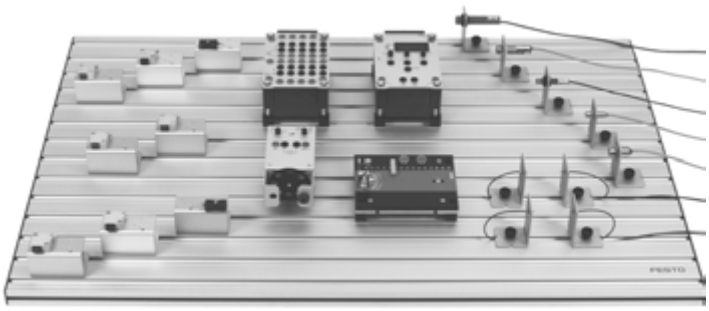
Training packages Sensors
Equipment sets

Proximity sensors, FP 1110



Training aims:
- Mode of operation
- Sensor properties
- Technical data
- Electrical connections
- Electrical circuit diagram
- Sensing range
- Actuating materials
- Applications
- Selection of sensors
- Sensor adjustment, limitations of applications
- Overview of designs used in industrial practice

Recommended study media:
- Textbook Proximity sensors
- Workbook Proximity sensors
- Transparency set Sensors
- Video Sensor modules in automation

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Vernier caliper (Order no. 035 653)
- Digital multimeter (Order no. 035 681)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Set of test objects	1	034 083
Graph paper pad, mm grid	1	034 085
Positioning slide	1	034 094
Ruler	1	035 697
Reflector unit for reflex light barrier	1	150 504
Optical fiber for one-way light barrier	2	150 505
Optical fiber for diffuse reflective optical sensor	1	150 506
Distributor unit	1	162 248
Counter unit	1	162 252
Proximity sensors, non-contact, inductive-magnetic	1	167 055
Reed switch	1	167 056
One-way light barrier, transmitter	1	167 064
Optical proximity sensor with fiber-optic connector, block-shaped	2	167 065
Diffuse reflective optical sensor, block-shaped	1	167 066
One-way light barrier, receiver	1	167 067
Diffuse reflective optical sensor, block-shaped	1	167 068
Rotary unit	1	167 097
Optical sensor with fiber-optic connector, cylindrical, M18	1	167 166
Inductive proximity sensor, cylindrical, M12	1	177 464
Inductive proximity sensor, cylindrical, M18	1	177 466
Capacitive proximity switch, cylindrical, M12	1	177 470
Ultrasonic proximity sensor, cylindrical, M18	1	184 118
Plug-in adapter	16	323 571
Equipment set, complete		**184 474**

(Technical data and description: Sensors Chapter – Components)

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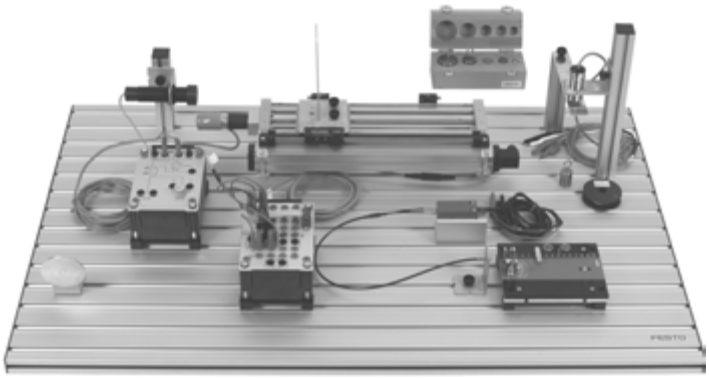
Training packages Sensors
Equipment sets

Sensors for distance and displacement, FP 1120



Training aims:
- Mode of operation of distance and displacement sensors
- Application of inductive, optical and ultrasonic sensors for non-contact distance measurement
- Active and passive sensors
- Installation and connection of an electrically driven spindle drive unit as a measuring device
- Control of spindle drives with a geared motor and displacement sensor
- Measuring techniques
- Measured value recording
- Recording the sensor characteristic
- Practical measurements
- Influence of interference
- Limitations of application

Recommended study media:
- Workbook Sensors for distance and displacement
- Transparency set Sensors
- Video Sensor modules in automation

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Vernier caliper (Order no. 035 653)
- Digital multimeter (Order no. 035 681)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Intermediate plate	1	019 500
Adapter for height adjustment	1	019 505
Set of weights	1	034 009
Reflector set	1	034 070
Set of test objects	1	034 083
Positioning slide	1	034 094
Deflecting arm	1	036 279
Spindle drive unit, ball screw	1	080 824
Geared motor	1	080 828
Assembly profile, length: 318 mm	1	109 383
Assembly profile, length: 168 mm	1	115 615
Assembly profile, length: 168 mm	1	115 616
Adapter for profile plate	1	150 519
Mountable vernier caliper	1	150 536
Signal switching unit	1	150 538
Assembly set for rotary drive	1	150 539
Mounting set for mountable vernier caliper	1	150 540
Connection unit, analog	1	162 247
Motor control unit	1	162 249
Analog optical distance sensor	1	167 051
Linear potentiometer	1	177 465
Analog ultrasonic distance sensor	1	177 469
Analog inductive distance sensor	1	184 117
Proximity sensors, non-contact, inductive-magnetic	2	184 130
Plug-in adapters	12	323 571
Equipment set, complete		**184 475**

(Technical data and description: Sensors Chapter – Components)

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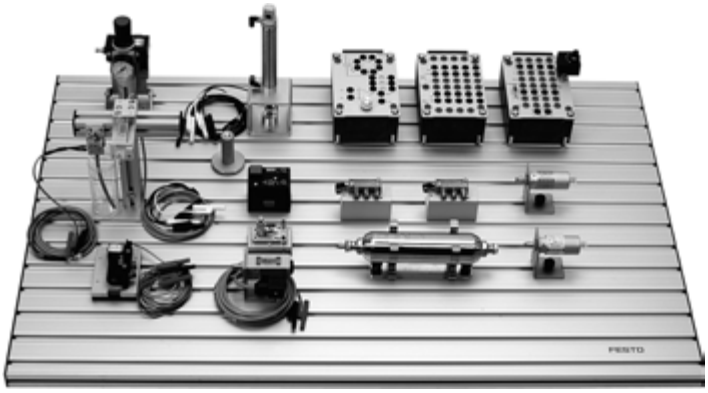
Training packages Sensors
Equipment sets

Sensors for force and pressure, FP 1130



Training aims:
- Mode of operation, properties and characteristics of force and pressure sensors
- Measuring strain and force with a strain gauge
- Mode of operation of an industrial force sensor
- Pneumatic and electrical connection of pressure sensors
- Measuring techniques
- Data acquisition
- Setting up a measuring chain
- Measuring sensor characteristics
- Practical measurements
- Interference
- Limitations in application

Recommended study media:
- Workbook Sensors for force and pressure
- Transparency set Sensors
- Video Sensor modules in automation

(Please refer to chapter: Software and Courseware)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Compressor (Order no. 091 030)
- Digital multimeter (Order no. 035 681)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Set of weights	1	034 009
Assembly profile, length: 170 mm	1	107 635
Assembly profile, length: 168 mm	1	115 608
Signal switching unit	1	150 538
Set of circular weights	1	150 543
Pressure distributor	2	150 555
Accumulator	1	150 557
Cylinder	1	150 578
Plastic tubing, 10 m, PUN 4 x 0.75	1	151 496
3/2-way valve with pushbutton actuator, normally closed	1	152 860
One-way flow control valve	1	152 881
Start-up valve with filter control valve, 40 µm	1	152 894
Connection unit, analog	1	162 247
Distributor unit	1	162 248
Measuring bridge amplifier	1	162 250
Deflecting-arm strain gauges	1	167 052
Backpressure sensor	1	167 053
Force sensor	1	167 054
Pneumatic-electronic switch	1	177 459
Pressure switch	1	177 471
Analog pressure sensor 1	1	184 128
Analog pressure sensor 2	1	184 129
L quick push-pull connector	1	186 117
Plug-in adapters	27	323 571
Equipment set, complete		**184 476**

(Technical data and description: Sensors Chapter – Components)

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Training packages Sensors
Components

The technical data indicated here applies to all components (unless otherwise defined):	Pneumatic connection	Quickstar connectors QS-4 for plastic tubing PUN 4 x 0.75
	Pneumatic medium	Filtered lubricated and unlubricated compressed air
	Electrical connection	4 mm safety sockets or safety plugs
	Voltage supply	24 V DC

Intermediate plate — FP 1120 — Order no. 019 500

(Not shown) For mounting of the reflector for the ultrasound sensor on the slide unit.

Adapter for height adjustment — FP 1120 — Order no. 019 505

(Not shown) Changes the working height of the slide unit.

Set of weights — FP 1120, FP 1130 — Order no. 034 009

Contains 5 weights from 20 to 500 g.

Set of reflectors — FP 1120 — Order no. 034 070

(Not shown) Consists of 3 reflectors of different widths.

Set of test objects — FP 1110, FP 1120 — Order no. 034 083

Set of test objects in a practical plastic case with objects of various types:
- Magnet
- Mild steel
- Stainless steel
- Aluminium
- Brass
- Copper
- Cardboard
- Rubber
- Plastic
- Kodak gray card

Additional components:
- Holder for fiber optic cable
- Base plate with gear wheels
- Holding bracket for level measurement with one-way light barrier
- Beaker
- 2 screws
- Workpiece ‘valve housing’
- Screwdriver

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Training packages Sensors
Components

Graph paper pad, mm grid | FP 1110 | Order no. 034 085

(Not shown)

For drawing the response curves of optical sensors.

Positioning slide | FP 1110, FP 1120 | Order no. 034 094

The positioning slide allows measurement of position and range for proximity switches. Magnetic holders allow a vernier caliper (Order no. 035 653) to be mounted. This increases the accuracy of measurements. When ordering the positioning slide on its own, please also order 4 plug-in adapters (Order no. 323 571) for mounting on the aluminium profile plate.

Slide travel	150 mm
Graduation	1 mm
Angular scale	±90°
Graduation	2°
Vernier scale	0.2 mm
Max. clamping thickness	5 mm

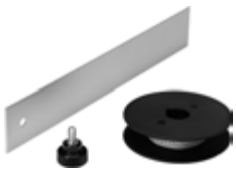
Ruler | FP 1110 | Order no. 035 697

(Not shown)

Aluminiumruler for measuring the response range of ultrasound sensor and reflex sensor.

Length	1020 mm

Deflecting arm | FP 1120 | Order no. 036 279



Item to be measured for measuring compliance dependent on load.

Spindle drive unit | FP 1120 | Order no. 080 824

The spindle drive unit– with the geared motor (Order no. 080 828) – implements one-dimensional motion. Electrical drive can be controlled by a programmable logic controller or by the motor controller (Order no. 162 249).
When ordering the spindle drive unit alone, please also order adapters (Order no. 150 519) for mounting on the aluminium profile plate.

Max. displacement	260 mm
Attachment hole pattern Top	4 x Ø 5.3 (40 x 40 mm), with a counterbore on both sides for socket hand screws M5 2 x Ø 5.1 (36 x 15 mm)
Attachment hole pattern Sides	2 x M5 (36 x 15 mm)
Overall dimensions	Approx. 110 x 420 x 30 mm
Guide rod diameter	12 mm
Spindle pitch	3 mm

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Gear motor — FP 1120 — Order no. 080 828

The motor drives for the spindle drive unit (Order no. 080 824) and can be used – in combination with the assembly kit DE (Order no. 150 539) – as a rotary drive. Includes mounting.

Rated current _____ 0.3 A
Output rating _____ 3.31 W
Nominal speed _____ 158 min^{-1}
Motor starting torque _____ 60.75 Ncm
Nominal torque _____ 19 Ncm

Assembly profile — FP 1120, FP 1130

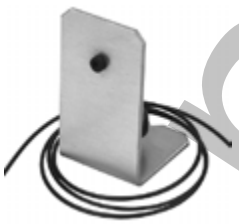
(Not shown)

Length _____ 168 mm	Order no. 115 608
Length _____ 168 mm	Order no. 115 615
Length _____ 168 mm	Order no. 115 616
Length _____ 170 mm	Order no. 107 635
Length _____ 318 mm	Order no. 109 383

Reflector unit for reflective light barrier — FP 1110 — Order no. 150 504

Diameter _____ 20 mm

Optical fiber for one-way light barrier — FP 1110 — Order no. 150 505



Diameter of fiber-optic cable _____ 1 mm
Length _____ 1000 mm
Bending radius _____ >25 mm
Nominal switching distance:
with Order no. 167 065 _____ 80 mm

Optical fiber for diffuse reflective optical sensor — FP 1110 — Order no. 150 506

Diameter of fiber-optic cable _____ 1 mm
Length _____ 1000 mm
Bending radius _____ >25 mm
Nominal switching distance:
with Order no. 167 065 _____ 30 mm

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Training packages Sensors
Components

Adapter for profile plate — FP 1120 — Order no. 150 519

(Not shown)

For mounting the positioning slide on the aluminium profile plate.

Mountable vernier caliper — FP 1120 — Order no. 150 536

The mountable vernier caliper with digital display (Order no. 150 540) can be mounted on the positioning slide (Order no. 080 824).
Delivery including battery (Type CR 2032, Li-Mn 3 V).

Measuring path_____286 mm
Measuring accuracy _____±0,03 mm
Resolution and repeat accuracy_____0.01 mm
Speed _____<1.5 m/s

Signal switching unit — FP 1120, FP 1130 — Order no. 150 538

Switching unit for the selection of analog voltage inputs.
U_0...U_3 on output 0 and the analog current inputs
I_0...I_3 on output 1 of the analog connection unit

Assembly set for rotary drive — FP 1120 — Order no. 150 539

(Not shown)

For use of the geared motor as a rotary drive.

Mounting set for mountable vernier caliper — FP 1120 — Order no. 150 540

(Not shown)

Material for mounting the mounted caliper gauge on the positioning slide.

Set of circular weights — FP 1130 — Order no. 150 543

Consisting of 10 disk weights at 1000 g each.

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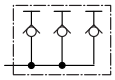
Pressure manifold — FP 1130 — Order no. 150 555



The side connector of the pressure manifold has an L plug-in coupling, the other connectors have self-closing plug-in couplings.

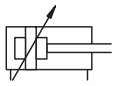
Pressure range _____ 0 – 1600 kPa (0 – 16 bar)

Accumulator — FP 1130 — Order no. 150 557

The accumulator can be used for the following applications:
– Generation of static pressures with the aid of a one-way flow control valve
– Generation of larger delay times in connection with time-delay and flow control valves
– Compensation of pressure fluctuations
– Use as reservoir in the event of sudden pressure loss

Design _____ Brazed brass container
Type of mounting _____ Spring clips, retaining plate
Volume _____ 400 ml
Pressure range _____ 0 – 1600 kPa (0 – 16 bar)

Cylinder — FP 1130 — Order no. 150 578



End-position cushioning can be set by means of two adjusting screws. The cylinder is mounted on the forces sensor unit (Order no. 167 054).

Design _____ Double-acting cylinder
Operation pressure _____ Max. 1000 kPa (10 bar)
Stroke length _____ Max. 100 mm
Thrust at 600 kPa (6 bar) _____ 267 N
Return force min. at 600 kPa (6 bar) _____ 220 N

Plastic tubing, PUN 4 x 0.75 — TP 101, TP 102, BIBB-P, TP 201, TP 111, PneuPos, FP 1130, TP 301

Exterior diameter _____ 4 mm
Interior diameter _____ 2.8 mm

Metallic silver	10 m	Order no. 151 496
Blue	1 m	Order no. 159 662
Black	1 m	Order no. 159 663
Yellow	1 m	Order no. 178 417
Green	1 m	Order no. 178 424
Red	1 m	Order no. 178 410

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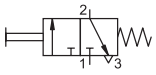
Training packages Sensors
Components

3/2-way valve with pushbutton actuator, normally closed

TP 101, TP 102, BIBB-P, TP 111, FP 1130

Order no. 152 860

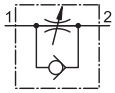


Construction	Poppet valve, directly actuated, one side, with return spring
Pressure range	0 – 800 kPa (0 – 8 bar)
Nominal flow rate 1...2	60 l/min

One-way flow control valve

TP 101, TP 102, BIBB-P, TP 111, FP 1130

Order no. 152 881



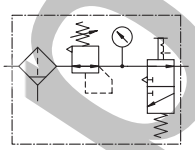
The one-way flow control valve consists of a combination of flow-control valve and a non-return valve. The throttle cross section can be controlled adjusted by a milled screw.

Construction	Flow-control valve / non-return valve
Pressure range	30 – 1000 kPa (0,3 – 10 bar)
Nominal flow rate	
in flow control direction	0 – 180 l/min
in open direction	180/110 l/min
(Throttle valve open/closed)	

Start-up valve with filter control valve, 40 µm

TP 101, BIBB-P, TP 201, FP 1130, TP 301

Order no. 152 894



Filter control valve with pressure gauge, start-up valve, quick push-pull connectors and quick couplings, mounted on a swivel support.
The filter with water separator removes dirt, pipe sinter, rust and condensed water. The pressure control valve regulates the supply air pressure to the set operating pressure and compensates pressure fluctuations. The filter bowl has a condensate drain valve.
The start-up valve/shutoff valve ventilates and vents the entire control. The 3/2-way valve is actuated by a rotary button.

Design	Sintered filter with water trap, piston regulator valve
Nominal flow rate*	750 l/min
Input pressure	Maximum 1600 kPa (16 bar)
Working pressure	Maximum 1200 kPa (12 bar)
Grade of filtration	40 µm
Condensate quantity	14 cm^3
Connector	G 1/8, QS-6, for plastic tubing PUN 6 x 1

* Input pressure: 1000 kPa (10 bar), Operating pressure: 600 kPa (6 bar), Differential pressure: 100 kPa (1 bar).

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Connection unit, analog — FP 1120, FP 1130 — Order no. 162 247

Permissible voltage range _____ 22 – 27 V DC
Reference _____ GND

Analog voltage inputs Input U _____ 4
Range _____ -10 – +10 V (max. 30 V)
Input resistance _____ 200 kΩ

Analog current inputs Input I _____ 4
Range _____ 0 – 20 mA (max. -4 – +24 mA)
Input voltage _____ Max. ±30 V

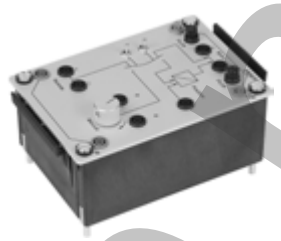
Analog outputs _____ 2
Voltage _____ -10 – +10 V, short-circuit-protected, max. ±30 V, fuse-protected
Current _____ Max. 20 mA

Also suitable as analog connection unit for FPC 101 AF. Using an analog cable (Order no. 189 551) the unit can also be used as an analog connection unit for the S7 and IPC EduTrainer.

Distribution unit — FP 1110, FP 1130 — Order no. 162 248

Contact set _____ 12
Power consumption of audible indicator ___ 1.2 W

Motor controller — FP 1120 — Order no. 162 249



Motor output _____ ±20 V DC/300 mA
Remote input _____ ±10 V DC
Position input _____ 0 – 24 V DC
Proximity sensor inputs _____ 24 V DC/30 mA
Positioning accuracy _____ ±5 %

Measuring bridge amplifier — FP 1130 — Order no. 162 250

Power consumption _____ 50 mA
Complementary resistors _____ 350 Ω
Bridge supply voltage _____ 5 V DC
Amplifier input range _____ ±10 mV
Amplifier output range _____ ±5 V
Amplification _____ Approx. 500

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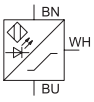
Training packages Sensors
Components

Counting unit FP 1110 Order no. 162 252

Input signal voltage	+15 – +24 V
Power consumption	1.2 W
Accuracy:	
Pulse output 100 pulses/s	±6 %
Pulse output 1000 pulses/s	±3 %
Internal clock	±3 %

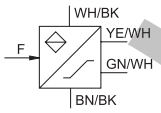
Optical analog distance sensor FP 1120 Order no. 167 051

Current output	4 – 20 mA
Measuring range with fiber-optic cable (adjustable via potentiometer)	8 – 40 mm
Response time	<1 ms
Linearity error	±5 % of full-scale value
Reproducibility	0.2 mm
Reverse polarity protection	Yes



Deflecting arm force sensor FP 1130 Order no. 167 052

Measuring range	0 – 5 N
Overload	130 % of measuring range
Strain gauge type	Foil SG
Strain gauge resistance	350 Ω
Max. permissible supply voltage	10 V



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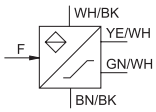
Backpressure switch FP 1130 Order no. 167 053

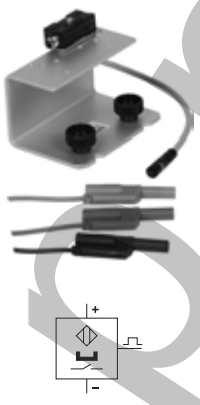
Bursting pressure	200 kPa (2 bar)
Switching frequency	Max. ca. 200 Hz
Mech. service life	>10^8 switching cycles
Switching performance	Max. 50 mA at 24 V DC
Measuring range	120 – 800 Pa (1.2 – 8 mbar)

Force sensor FP 1130 Order no. 167 054



Measuring range	0 – 200 N
Measuring error	1 % of full-scale value
Sensitivity (nominal)	1 mV/V
Overload	130 % of measuring range
Breaking load	200 % of measuring range
Distance moved under nominal load (calibration in pressure direction)	0.1 mm max.
Bridge resistance (full bridge)	350 Ω (nominal)
Supply voltage, permissible	3 – 10 V AC/DC

Non-contact inductive-magnetic proximity sensor FP 1110 Order no. 167 055



Switching output	PNP, normally open
Switching point accuracy	±0.1mm
Switching point drift	±0.1mm
Response travel (dependent on magnetic field)	7 – 17 mm
Hysteresis	0.1 – 1.5 mm
Maximum switching frequency	1000 Hz
Polarized, short-circuit-proof	Yes

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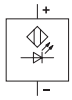
Training packages Sensors
Components

Reed switch | FP 1110 | Order no. 167 056

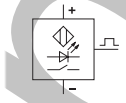
Switching voltage (reduced brightness of the LED at 18 V)	12 – 27 V AC/DC
Switching point accuracy	±0.1mm
Volume resistance	100 mΩ
Switching time (incl. bounce time)	<2 ms
Maximum switching frequency	500 Hz

One-way light barrier, transmitter | FP 1110 | Order no. 167 064



Type of light	IR, 880 nm
Nominal switching distance	10 m
Polarized, short-circuit-proof	Yes

Optical sensor with optical fiber connector, block-shaped | FP 1110 | Order no. 167 065



Type of light	Red light, 660 nm
Switching output	PNP, normally opened/closed, exclusive OR
Nominal switching distance (with fiber-optic cable ES, Order no. 150 505)	80 mm
Nominal switching distance (with optic-optic cable RT, Order no. 150 506)	30 mm
Hysteresis (referred to nominal switching distance	<10 %
Reproducibility	±10 %
Maximum switching current	250 Hz
Polarized, short-circuit-proof	Yes

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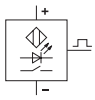
Infrared light barrier, block-shaped — FP 1110 — Order no. 167 066

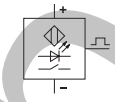


Type of light	IR, 880 nm
Switching output	PNP, normally open/closed, exclusive OR
Nominal switching distance (with reflector, Order no. 150 504)	1.5 m
Operational switching distance	0.01 – 1.2 m
Hysteresis (referred to nominal switching distance)	<10 %
Reproducibility	±10 %
Maximum switching frequency	250 Hz
Polarized, short-circuit-proof	Yes

One-way light barrier, receiver — FP 1110 — Order no. 167 067

Type of light	IR, 880 nm
Switching output	PNP, normally open/closed, exclusive OR
Nominal switching distance	10 m
Operational switching distance (adjustable)	0 – 8.1 m
Hysteresis (referred to nominal switching distance)	<10 %
Reproducibility	±10 %
Maximum switching frequency	50 Hz
Polarized, short-circuit-proof	Yes

Diffuse reflective optical sensor, block-shaped — FP 1110 — Order no. 167 068



Type of light	IR, 880 nm
Switching output	PNP, normally open/closed, exclusive OR
Nominal switching distance (adjustable)	360 mm
Hysteresis (at nominal switching distance)	2 – 15 %
Reproducibility	±10 %
Maximum switching frequency	250 Hz
Polarized, short-circuit-proof	Yes

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Training packages Sensors
Components

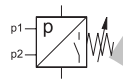
Rotary unit | FP 1110 | Order no. 167 097

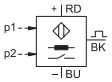
Current consumption _____ 100 mA
Rotational speed range _____ 600 – 4900 rpm

Optical sensor, Type M18 | FP 1110 | Order no. 167 166

Type of light _____ Red light, 660 nm
Switching output _____ PNP, normally open
Nominal switching distance _____ 150 mm
Hysteresis (referred to nominal switching distance) _____ <10 %
Reproducibility _____ ±10 %
Maximum switching frequency _____ 250 Hz
Polarized, short-circuit-proof _____ Yes

Pneumatic-electrical converter | TP 201, BIBB-EP, FP 1130 | Order no. 177 459





The pneumatic electrical converter fulfils three functions:
Pressure switch, vacuum switch, differential pressure switch.

Pneumatic technical data
Construction _____ Prestressed metal bellows initiator
Pressure ranges:
Pressure switch, connector P1 _____ 25 – 800 kPa (0.25 – 8 bar)
Vacuum switch, connector P2 _____ -20 – -80 kPa (-0.2 – -0.8 bar)
Differential pressure switch:
connectors P1...P2 _____ -95 – 800 kPa (-0,95 – 8 bar)
Hysteresis _____ Maximum 25 kPa (0.25 bar)

Electrical technical data
Switching current _____ 400 mA

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Inductive proximity sensor, Type M12

FP 1110

Order no. 177 464

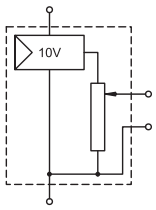
Switching output PNP, normally open
Nominal switching distance (for S 235 JR) 4 mm
Hysteresis (referred to nominal switching distance) 1 – 15 %
Maximum switching frequency 400 Hz
Polarized, short-circuit-proof Yes

Linear potentiometer, 300 mm stroke

FP 1120

Order no. 177 465

Suitable for slide unit (Order no. 80 824). Assembly with mountable vernier caliper (Order no. 150 536) with the aid of the assembly set (Order no. 150 540).



Permissible operating voltage* 13 – 30 V DC
Potentiometer resistance 5 kΩ
Electrical pick-up length 304 mm
Output voltage* 0 – 10 V DC
Max. linearity error ±0.07 % of full-scale value
Resolution and reproducibility 0.01 mm
Polarity protection Yes
Adjustment speed 10 m/s
Adjustment acceleration 200 m/s²

* Applicable for potentiometer including impedance converter.

Inductive proximity sensor, Type M18

FP 1110

Order no. 177 466

Switching output PNP, normally open
Nominal switching distance (for S 235 JR) 5 mm
Hysteresis (referred to nominal switching distance) 1 – 15 %
Maximum switching frequency 500 Hz
Polarized, short-circuit-proof Yes

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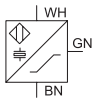
Training packages Sensors
Components

Analog ultrasound distance sensor — FP 1120 — Order no. 177 469

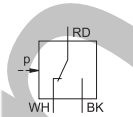


Permissible operating voltage	24 V DC
Current output	6 – 20 mA
Measuring range	150 – 500 mm
Temperature drift	0.1%/°C
Linearity error	±0.2 % of full-scale value
Measuring clock frequency	40 Hz
Acceptance angle of sound cone	Approx. 5°
Polarity protection	Yes

Capacitive proximity switch, Type M12 — FP 1110 — Order no. 177 470

Switching output	PNP, normally open
Nominal switching distance	4 mm
Hysteresis (referred to nominal switching distance)	3 – 15 %
Maximum switching frequency	100 Hz
Polarized, short-circuit-proof	Yes

Pressure switch — FP 1130 — Order no. 177 471



Design	Pneumatic-electric signal converter
Installation angle	Any

Connections

Pneumatic	Internal thread R ¼
Electrical	Appliance socket to DIN 43650
Pressure range	100 – 1200 kPa (1 – 12 bar)
Overload pressure	Short-term max. 5000 kPa (50 bar)
Switching frequency	Max. 3.3 Hz
Reproducibility of switching point	<±3 %

Switching capacity*

Direct current	24 V: 6A/220 V: 0.5 A
Alternating current	220 V: 5 A

* The electrical life is reduced when used under maximum load.

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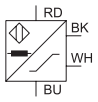
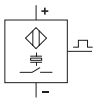
Training packages Sensors
Components

Inductive analog distance sensor — FP 1120 — Order no. 184 117



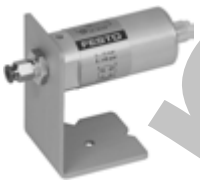
Permissible operating voltage	15 – 30 V DC
Voltage output	0 – 10 V
Load resistance	4.7 kΩ
Current output	0 – 20 mA
Load resistance	500 Ω
Measuring range	3 – 8 mm
Max. measuring frequency	80 Hz
Temperature error	±5 % of full-scale value
Linearity error	±3 % of full-scale value
Reproducibility	2 % of full-scale value
Polarized, short-circuit-proof	Yes

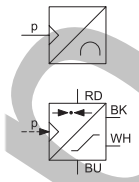
Ultrasonic proximity sensor, Type M18 — FP 1110 — Order no. 184 118



Permissible operating voltage	24 V DC, ±20 %
Switching output	PNP, normally open
Ultrasonic emitter frequency	215 kHz
Range	100 – 200 mm
Hysteresis (referred to nominal value)	<5 %
Reproducibility	±0.3 % or ±0,5 mm
Maximum switching frequency	60 Hz
Polarized, short-circuit-proof	Yes

Analog pressure sensor 1 — FP 1130 — Order no. 184 128





Pressure range*	0 – 1000 kPa (0 – +10 bar)
Max. perm. pressure	1400 kPa (14 bar)
Supply voltage V_B	12 – 30 V DC
Voltage output	0 – 10 V
Current output	0 – 20 mA
Total error	±1 % of full-scale value
Max. measuring frequency	100 Hz
Electrical protection	Short circuit proof, polarity reversal protection, overvoltage-proof up to 50 V DC (short-term)

* The sensor provides a signal even if pressure <0 bar. Linearity and proportionality are not guaranteed in this case.

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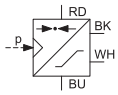
Training packages Sensors
Components

Analog pressure sensor 2 — FP 1130 — Order no. 184 129

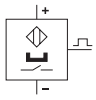


Pressure range*	0 – 1000 kPa (0 – +10 bar)
Max. perm. pressure	1400 kPa (14 bar)
Supply voltage V_B	12 – 30 V DC
Voltage output	1 – 5 V
Current output	4 – 20 mA
Total error	±1 % of final value
Max. measuring frequency	100 Hz
Electrical protection	Short circuit proof, polarity reversal protection, overvoltage-proof up to 50 V DC (short-term)

* The sensor provides a signal even if pressure <0 bar. Linearity and proportionality are not guaranteed in this case.

Proximity sensor, non-contacting, inductive-magnetic — FP 1120 — Order no. 184 130

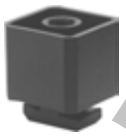
For mounting on the slide unit (Order no. 080 824). Including cable.



Power supply	10 – 30 V DC
Switching capacity	6 W
Overcurrent trip	Min. 250 mA
Switching accuracy	±0.1mm

Plug-in adapter — FP 1110, FP 1120, FP 1130 — Order no. 323 571

For mounting of components with plug-in foot on the aluminium profile plate.



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Training packages Electronics/PLC
Overview

First Choice Partner Siemens – Festo

Benefit from cooperation between two market leaders: Siemens controllers and software are standard in all equipment sets. And as a SIMATIC Solution Provider we offer lots of expertise and experience for your training projects.

Controllers

SIMATIC S7 EduTrainer®

Festo EduTrainer®

Process models

Programmable logic controller, TP 301

VEEP®2, Virtual process environment for industry-focused PLC training

EduTrainer®

The new learning concept for PLC technology.
Industrial controllers – as used in practice – are not always suitable for training purposes. The EduTrainer® concept meets these special demands.

Fieldbus

S7 EduTrainer®
with ASi, Profibus DP and Ethernet

Components

SIEMENS components for
S7 EduTrainer®

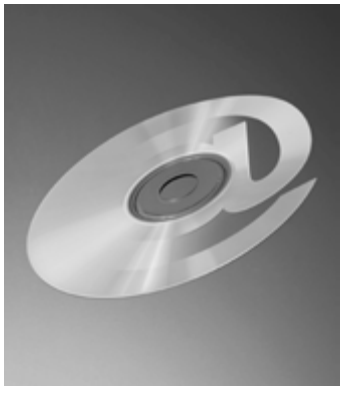
Festo components

Open for all systems

As a result of its universal interfaces, the PLC technology learning environment offers solutions for all makes of PLC.

The perfect learning environment

Software, CBTs, textbooks, collections of exercises and videos, each produced in many languages, create a pleasant learning environment for each training package.



Festo Didactic
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Training packages Electronics/PLC
Overview

Pick your process model

With an EduTrainer® or any PLC, you can control the process of your choice. The programmer (PC), controller and process model are connected via various interfaces.

The benefits of the EduTrainer® over PLCs as used in industrial practice:

– PLC is integrated into housing – can be fitted into nearly all laboratory furniture systems
– Can also be used as a tabletop device or mounted on a profile plate
– Fits into the ER and DIN A4 support frames of many lab systems
– Connection of sensors and actuators to the PLC I/Os via 4 mm safety plugs
– Inputs can be simulated with switches and potentiometer
– With SysLink universal I/O interface socket– the link to all Festo Didactic equipment sets

Process model
Simulation of PLC inputs and display of PLC outputs

Testing a PLC program with the simulation box.

Components for EduTrainer®	**Components for any PLC with terminal strip**
EduTrainer® of your choice	PLC of your choice
I/O data cable with SysLink connectors as per IEEE 488 at both ends (Order no. 034 031)	I/O data cable with one SysLink connector as per IEEE 488 and cable-end sleeves (Order no. 167 122)
Simulation box (SysLink) (Order no. 170 643)	Simulation box (SysLink) (Order no. 170 643)

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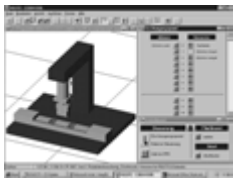
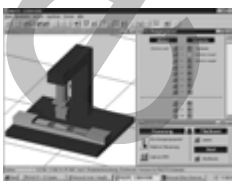
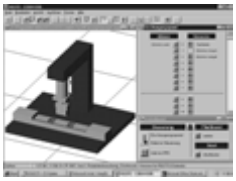
Process model
Control of virtual process models

Industry-focused cost-effective PLC training with VEEP®2.



Components for EduTrainer®	**Components for any PLC with terminal strip**
EduTrainer® of your choice	PLC of your choice
VEEP®2 for EduTrainer® (Order no. see section Process models) Consisting of: Interface EasyPort D16 (Order no. 167 121) PC data cable RS232 (Order no. 162 305) COSIVIS Process simulation software (Order no. see section Process models)  I/O data cable with SysLink connectors as per IEEE 488 at both ends, crossover (Order no. 167 106) 	VEEP®2 for any PLC (Order no. see section Process models) Consisting of: Interface EasyPort D16 (Order no. 167 121) PC data cable RS232 (Order no. 162 305) COSIVIS Process simulation software (Order no. see section Process models)  I/O data cable with one SysLink connector as per IEEE 488 and cable-end sleeves (Order no. 167 122)

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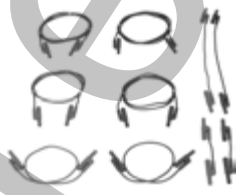
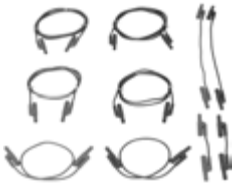
Training packages Electronics/PLC
Overview

Process model
Control of real modules

Here various training packages are available: for pneumatic, hydraulics and electrical engineering, and MPS® and Process Control System, the modular systems for training manufacturing and process-engineering processes.

Components for EduTrainer®	**Components for any PLC with terminal strip**
EduTrainer® of your choice	PLC of your choice
I/O data cable with SysLink connectors as per IEEE 488 at both ends (Order no. 034 031)*	I/O data cable with one SysLink connector as per IEEE 488 and cable-end sleeves (Order no. 167 122)
Universal connection unit (SysLink) for simple connection between controller and actuators/sensors (Order no. 162 231)	Universal connection unit (SysLink) for simple connection between controller and actuators/sensors (Order no. 162 231)
4 mm cable set, with or without safety plugs (Order no. 167 091 or 030 332) 	4 mm cable set, with or without safety plugs (Order no. 167 091 or 030 332) 
Equipment set TP 301 (Order no. 167 101) or other equipment sets or MPS®/Process Control System stations	Equipment set TP 301 (Order no. 167 101) or other equipment sets or MPS®/Process Control System stations

* To connect to the PLC board for MPS® or Process Control System stations, please use the I/O cable (Order no. 167 197) instead of the data cable listed above.

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SIMATIC S7 EduTrainer®
(for the ER-mounting frame or as desktop device)

The modular concept of the Siemens SIMATIC S7-300 has been adapted to a module for the ER mounting frame for workstation systems. Rubber feet allow the unit to be used as a desktop device. The CPU can be the S7-313, S7-314, S7-315 and the S7-315-2DP is available as a Profibus Master.

Interfaces:
– 2 SysLink sockets as per IEEE 488 each for 8 digital inputs/outputs
– Subminiature-D 15-pin socket for analog inputs/outputs
– 4 mm safety sockets for 24 V operating voltage (generated by load power supply), EMERGENCY STOP and ground
– Power supply unit 110/220 V AC and 50/60 Hz mains frequency (without power cable, order separately)
– MPI interface or additional Profibus DP interface for CPU S7-315-DP

Programming software:
– STEP 7 (IEC 1131-3)
The S7-313 can be programmed in STEP 7 IL, LD and FUC. The S7-314 and 315 also in S7-Graph and SCL.

Documentation:
– Manual S7-300 German (Order no. 184 557)
– Manual S7-300 English (Order no. 184 558)
– S7/STEP 7-Documentation on CD-ROM (Order no. 192 883)
(Please refer to chapter: Software and Courseware)

Necessary accessories:
– PC adapter/RS232 cable (Order no. 184 555)
– Power cable
For integrated analog module SM334:
– Connection unit, analog (Order no. 162 247)
– I/O cable, analog (Order no. 189 551)
(Technical data and description: Accessories chapter)

The possibilities for process simulation and process control are described in the chapter Electronics/PLC Overview.

Components	Quantity	Order no.
Load power supply PS 307-1E	1	185 979
CPU (optional):		
CPU SIMATIC S7-313	1	167 153
CPU SIMATIC S7-314	1	184 548
CPU SIMATIC S7-315	1	167 155
CPU SIMATIC S7-315-2DP	1	184 549
Digital I/O module SM323 8I/8O	2	184 550
Placeholder module	1	167 175
EduTrainer®, complete:		
SIMATIC S7 EduTrainer® 313*		**167 136**
SIMATIC S7 EduTrainer® 314*		**167 157**
SIMATIC S7 EduTrainer® 315*		**167 184**
SIMATIC S7 EduTrainer® 315-2DP*		**167 183**
Extensions (order separately):		
Analog input/output module SM334 4E/2A	1	184 804

(For technical data and descriptions of the SIMATIC modules, please see chapter SIEMENS components for S7 EduTrainer®)

* Housing dimensions 170 x 480 x 85 mm

Notes:
– In addition to the load power supply, the CPU and 2 digital I/O modules, there is space for an additional module.
– The S7 is connected to the programming device or the PC via the integrated MPI interface and the PC adapter cable, and programmed in STEP 7.
– Units are supplied ready assembled.
– Power cable not included in scope of delivery.

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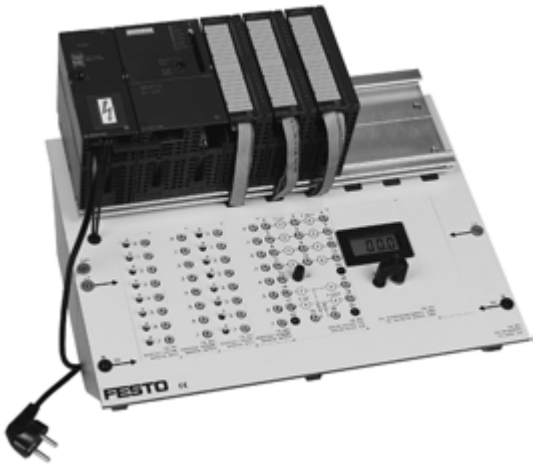
Training packages Electronics/PLC
Controllers

SIMATIC S7 EduTrainer® plus
(for the A4-mounting frame or as desktop device)



The modular concept of the Siemens SIMATIC S7-300 has been adapted to a modular DIN A4 experiment plate. This makes it possible to combine any CPU (central control unit) of this series with input and output modules, including simulation and 4 mm connection plates. The S7 EduTrainer® can be used to implement a standalone system just as easily as a system networked with Profibus-DP.

The S7 EduTrainer® can be supplied in the basic configuration with CPU without integrated I/Os, or with Type IFM CPU with integrated I/Os and the appropriate simulation and connection plates with 4 mm safety sockets.

Programming software:
– STEP 7 (IEC 1131-3)
The 312IFM and 313 CPUs can only be programmed in STEP 7 IL, FUC and LD. The S7-314 and S7-315 CPUs can also be programmed in S7-Graph and SCL.

Documentation:
– Manual S7-300 German
(Order no. 184 557)
– Manual S7-300 English
(Order no. 184 558)
– Manual S7-312/314IFM German
(Order no. 184 559)
– Manual S7-312/314IFM English
(Order no. 184 560)
– S7/STEP 7 documentation on CD-ROM
(Order no. 192 883)
(Please refer to chapter: Software and Courseware)

Necessary accessories:
– PC adapter/RS232 cable
(Order no. 184 555)
(Technical data and description: Accessories chapter)

The possibilities for process simulation and process control are described in the chapter Electronics/PLC Overview.

Components	Quantity	Order no.
Load power supply PS 307-1B	1	162 268
CPU (optional):		
CPU SIMATIC S7-312IFM with integrated 10 I/6 O digital	1	184 547
CPU SIMATIC S7-313	1	167 153
CPU SIMATIC S7-314	1	184 548
CPU SIMATIC S7-314IFM with integrated 20 I/16 O digital, 4 I/1 O analog	1	167 154
CPU SIMATIC S7-315	1	167 155
CPU SIMATIC S7-315-2DP	1	184 549
SIMATIC S7 EduTrainer® plus – Basic devices:		
SIMATIC S7 EduTrainer® plus 312IFM 10 I/6 O digital*		**167 173**
SIMATIC S7 EduTrainer® plus 313 (without I/Os)*		**167 137**
SIMATIC S7 EduTrainer® plus 314 (without I/Os)*		**167 139**
SIMATIC S7 EduTrainer® plus 314IFM 20 I/16 O digital, 4 I/1 O analog*		**167 138**
SIMATIC S7 EduTrainer® plus 315 (without I/Os)*		**167 140**
SIMATIC S7 EduTrainer® plus 315-2DP (without I/Os)*		**167 141**

(For technical data and description of the SIMATIC modules, please see chapter SIEMENS components for S7 EduTrainer®)

* Housing dimensions 297 x 400 x 130 mm

Notes:
– For CPUs 313, 314, 315 and 315-2DP, the I/O modules including simulation and connection plates have to be separately ordered (see extensions for the SIMATIC S7 EduTrainer® plus in this chapter).
– For the version with Type IFM CPUs, the simulation/base plates for the I/Os integrated into the CPU are included in the scope of delivery.
– The complete devices shown on the following pages represent sensible configurations with a CPU, I/O modules and other connection plates or empty plates. No further additions are required.

preliminaire

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SIMATIC S7 EduTrainer® plus Complete units
(A4 format)

Suitable for users who need only a few digital inputs and outputs and who want to work exclusively with the IL, LD and FUC programming languages. S7-SCL and S7-GRAPH cannot be used. Suited for TP 301 tasks.

Components	Order no.
SIMATIC S7 EduTrainer® plus with CPU 312IFM	**167 173**
SIMATIC S7 EduTrainer® plus with CPU 312IFM and SysLink socket	**167 213**

S7-312IFM with 10 digital inputs and 6 digital outputs at the CPU, as well as corresponding simulation boards or 4 mm terminal boards and empty plates.

Suitable for users who need to manage extensive projects with digital signal processing, and who want to work with the IL, LD and FUC, as well as the S7-SCL and S7-GRAPH programming languages. For use with MPS® stations or Festo Didactic I/O-coupled stations without analog processing.

Components	Order no.
SIMATIC S7 EduTrainer® plus with CPU 314	**167 214**
SIMATIC S7 EduTrainer® plus with CPU 314 and SysLink socket	**167 215**

S7-314 with 16 digital inputs (SM321) and 16 digital outputs (SM322), as well as corresponding simulation boards or 4 mm terminal boards and empty plates.

Suitable for users who need to manage extensive projects with digital and analog signal processing, and who want to work with the IL, LD and FUC, as well as the S7-SCL and S7-GRAPH programming languages. For use with MPS® stations or Festo Didactic I/O-coupled stations without or without analog processing.

Components	Order no.
SIMATIC S7 EduTrainer® plus with CPU 314IFM	**167 138**
SIMATIC S7 EduTrainer® plus with CPU 314IFM with Measuring Module	**167 216**
SIMATIC S7 EduTrainer® plus with CPU 314IFM with Measuring Module and SysLink socket	**167 217**

S7-314IFM with 20 digital inputs and 16 digital outputs, as well as 4 analog inputs and 1 analog output at the CPU with corresponding simulation boards or 4 mm terminal boards and empty plates.

Suitable for users who need to manage extensive projects with digital only, or with digital and analog signal processing, as well as Profibus DP, and who want to work with the IL, LD and FUC, as well as the S7-SCL and S7-GRAPH programming languages. Can be used with MPS® stations interlinked with Profibus DP with or without analog value processing.

Components	Order no.
SIMATIC S7 EduTrainer® plus with CPU 315-2DP*	**167 218**
SIMATIC S7 EduTrainer® plus with CPU 315-2DP with SysLink socket*	**167 219**
SIMATIC S7 EduTrainer® plus with CPU 315-2DP with Measuring Module and SysLink socket**	**167 220**

* S7-315-2DP with 16 digital inputs (SM321) and 16 digital outputs (SM322), as well as corresponding simulation boards or 4 mm terminal boards and empty plates.

** S7-315-2DP with 16 digital inputs (SM321) and 16 digital outputs (SM322), 4 analog inputs and 2 analog outputs (SM334), as well as corresponding simulation boards or 4 mm terminal boards and empty plates.

preliare

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Training packages Electronics/PLC
Controllers

Extensions for the SIMATIC S7 EduTrainer® plus
(suitable for all basic devices, not for complete devices)

The EduTrainer® accommodates 9 Simulation/connection plates. Unused slots are covered with blank plates. The extensions always consists of the SIMATIC module and the appropriate simulation/connection plates with detenting or momentary contact switches, or with potentiometers and 4 mm safety sockets. They are prewired and can be installed into the EduTrainer® with little effort.

Components	Order no.
16 digital inputs with momentary contact/detenting switches with SIMATIC SM321, 2 fields used	167 142
16 digital inputs without momentary contact/detenting switches with SIMATIC SM321, 2 fields used	167 143
16 digital outputs, with SIMATIC SM322, 2 fields used	167 144
8 digital inputs with momentary contact/detenting switches and 8 digital outputs with SIMATIC SM323, 2 fields used	167 145
8 digital inputs without momentary contact/detenting switches, and 8 digital outputs with SIMATIC SM 323, 2 fields used	167 146
2 analog inputs with potentiometer with SIMATIC SM 331, 1 field used	167 147
2 analog outputs with SIMATIC SM 332, 1 field used	167 148
4 analog inputs with potentiometer and 2 analog outputs with SIMATIC SM334, 2 fields used	167 149
Measuring module for display of analog voltage, 2 fields used	167 174
Base plate for the connection of Festo Didactic units (MPS® stations, VEEP®2). With 2 SysLink sockets each for 8 digital inputs and outputs and one Subminiature D-connector for 4 analog inputs and 2 analog outputs, 1 field used	167 151
Byte I/O for the input and display of a byte in hex code. Two plates are required for word input/output. 1 field used per plate	167 225
Empty plate, 1 field used.	167 152

(For technical data and description of the SIMATIC modules, please see chapter SIEMENS components for S7 EduTrainer®)

Note:
EduTrainer® plus with extensions are delivered ready assembled and tested.

pneuaire

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SIMATIC S7 EduTrainer® plus ET 200M

The ET 200M is a modular peripheral device for the distributed connection of I/O modules using the IM 153-1 interface module as a Profibus DP slave. Load power supply, interface module and signal modules are mounted on the DIN rail. The module is addressed via an S7-300 Profibus DP Master, e.g. S7-315-2DP.

The system with ET 200M corresponds to those with S7-300 CPU. Instead of the CPU, the SIMATIC IM 153-1 interface module is installed. The configuration with signal modules is freely selectable and is undertaken according to the same rules as other S7 EduTrainers®. Power is supplied by the PS 307-1B load power supply.

Recommended accessory:
– Profibus cable
(Order no. 350 412)
(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Load power supply PS 307-1B	1	162 268
IM 153-1	1	167 156
Basic unit SIMATIC S7 EduTrainer® plus ET 200M*		**167 150**

(For technical data and description of the SIMATIC modules, please see chapter SIEMENS components for S7 EduTrainer®)

* Housing dimensions 297 x 400 x 130 mm

Note:
The I/O modules with simulation plates are optional extras. They are not part of Order no. 167 150.

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Training packages Electronics/PLC
Controllers

FEC EduTrainer®
(for the ER mounting frame or profile plate)

The FEC is a compact, powerful PLC, adaptable for industrial application, quick and simple to install. This compact controller in industrial design with 12 digital inputs and 8 digital relay outputs offers all the functions required for automation tasks requiring only a few I/Os. The status of inputs and outputs is shown via LEDs. The FEC EduTrainer® FST can be programmed with Festo FST in IL and LD, the FEC EduTrainer® MWT can be programmed in accordance with IEC 1131-3 using the MULTIPROG wt programming software.

Interfaces:
– 4 mm safety sockets (12 I/8 O digital)
– SysLink (8 I/8 O digital)
– RS 232 programming interface
– 4 mm safety sockets for 24 V operating voltage
– Ethernet (for Order no. 193 730)

Programming software:
– Festo FST
– MULTIPROG wt
Documentation:
– included.
(See Software chapter)

Necessary accessories:
– PC data cable RS232
(Order no. 162 305)
– 4 plug-in adapters for the profile plate
(Order no. 323 571)
– Tabletop power supply unit or power supply unit for the mounting frame
(Technical data and description: Accessories chapter)

The possibilities for process simulation and process control are described in the chapter Electronics/PLC Overview.

Components	Quantity	Order no.
CPU (optional):		
FEC-20DC FST	1	177 428
FEC-FC34 MWT	1	191 448
EduTrainer®, complete		
FEC EduTrainer® FST*		**167 132**
FEC EduTrainer® MWT*/ with Ethernet interface**		**193 730**

(For technical data and description see chapter Electronic/PLC components)

* Housing dimensions 170 x 240 x 85 mm

** This variant of the FEC EduTrainers® includes the programming cable and MULTIPROG wt programming software. The CD-ROM also contains the manuals as PDF files (in English and German).

preliminarie

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FEC starter kit with Ethernet interface

The FEC starter kit MWT from Festo Didactic is ideal for getting started in PLC training and for those who place special emphasis on programming in compliance with IEC 1131-3. The integrated Ethernet interface allows several controllers to be interconnected or to be connected to a PC.

The starter kit consists of the new Festo Mini-PLC FEC-FC34 and "MULTIPROG wt" programming software. The only other things required are a 24 V power supply and a PC. The CD-ROM supplied contains the MULTIPROG wt software in English, French and German, all manuals, including the programming manual, as PDF files in English and German, and various Microsoft PowerPoint shows.

Necessary accessories:
– Tabletop power supply unit or power supply unit for the support frame
(Technical data and description: Accessories chapter)

For connection possibilities with simulation box, VEEP2 or components of the TP 301 equipment set, please see the chapter Electronics/PLC Overview.

Components	Quantity	Order no.
FEC-FC34 MWT	1	
Programming cable with converter TTL-RS232	1	
Input simulator with 8 pushbuttons and latched switches	1	
CD-ROM*	1	
Complete FEC starter kit MWT		**192 778**

* The CD-ROM can also be ordered separately (Order no. 189 530, see chapter Software).

preliminary

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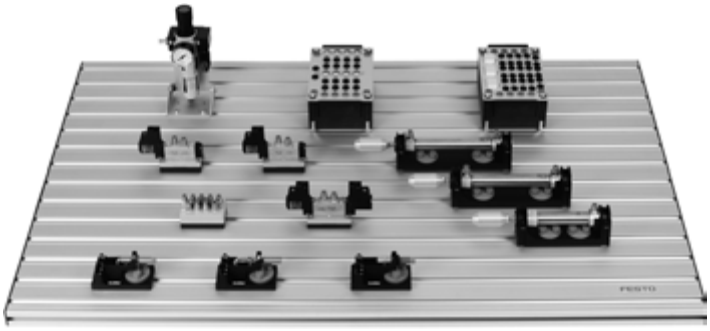
Training packages Electronics/PLC
Process models

Programmable logic controller, TP 301



Training aims:
- Benefits of the PLC compared to conventional solutions such as electrical, electropneumatic or electrohydraulic solutions
- Functions of system components of a PLC
- Commissioning a PLC
- Application criteria for mechanical, optical, capacitive and inductive proximity switches
- Sequence control and parallel logic
- Systematic programming of a PLC in accordance with international standard IEC 1131-3
- IEC 1131-3 programming languages: Function Block Diagram, Ladder Diagram, Statement List, Structured Text and Sequence Language

To complete the exercises in this training package, you need a controller with 24 V DC input and output signals. The actuators and sensors can be connected via 4 mm safety plugs.

Recommended study media:
- Textbook Programmable Logic Controller, Basic level
- Workbook Programmable Logic Controller, Basic level
- Solutions to the exercises in the workbook for various controllers
- Transparency set Programmable Logic Controller, Basic level
- Video Programmable Logic Controller, Basic level

(See Courseware chapter)

Recommended accessories:
- Aluminium profile plate (1100 x 700 mm) (Order no. 159 411)
- Compressor (Order no. 091 030)
- Universal connection unit, digital (SysLink) (Order no. 162 231)
- Tabletop power supply unit or power supply unit for the mounting frame
- Set of cables (Order no. 167 091)

(Technical data and description: Accessories chapter)

Components	Quantity	Order no.
Plastic tubing, 10 m, PUN 4 x 0,75	2	151 496
Single-acting cylinder	1	152 887
Double-acting cylinder	2	152 888
Start-up valve with filter control valve, 40 µm	1	152 894
Manifold	1	152 896
Quick push-pull distributor	1	153 128
Signal input, electrical*	1	162 242
Indicator unit and distributor, electrical*	1	162 244
Proximity switch, electronic, with cylinder attachment	4	167 060
5/2-way solenoid valve with LED	2	167 074
5/2-way double solenoid valve with LED	1	167 076
Proximity switch, inductive	1	178 574
Proximity switch, capacitive	1	178 575
Proximity switch, optical	1	178 577
Equipment set, complete		**167 101**

(Technical data and description: Electronics/PLC components chapter)

* Four plug-in adapters are required for securing components to the profile plate (Order no. 323 571), see Accessories.

Supplementary equipment set Electropneumatics, Basic level TP 201 to Programmable logic controller, TP 301

For training content, see Programmable logic controller equipment set, TP 301 (on this page).

Components	Quantity	Order no.
Proximity switch, electronic, with cylinder attachment	2	167 060
Proximity switch, inductive	1	178 574
Proximity switch, capacitive	1	178 575
Proximity switch, optical	1	178 577
Supplementary equipment set		**167 102**

(Technical data and description: Electronics/PLC components chapter)

preliminarie

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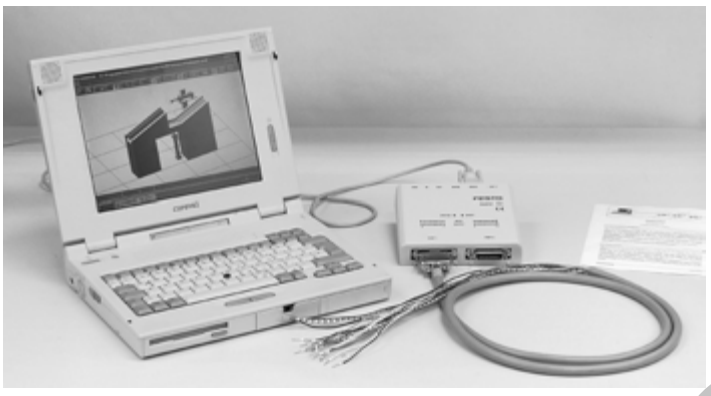
VEEP®2
Virtual process environment for industry-focused PLC training



VEEP®2 is a tool for practice-focused, realistic PLC training with any PLC. The digital inputs and outputs (24 V) of a PLC control various simulated processes via an interface on the PC, that is, set PLC outputs control the software module and changing sensor signals influence processing of the PLC program via the PLC inputs.

The motion sequence on the screen corresponds to the hardware setup of the TP 301 training package or an MPS® station. VEEP®2 allows motion-critical sequences to be simulated safely on a PC before the program controls real hardware. COSIVIS simulation software is described in detail in the Software chapter.

Recommended study media:
– Textbook Programmable Logic Controller, Basic level
– Workbook Programmable Logic Controller, Basic level
– Solutions to the exercises in the workbook for various controllers
– The workbooks of the MPS® stations
(See Courseware chapter)

VEEP®2 for coupling with: Components	**Any PLC** Order no.	**PLC EduTrainer®** Order no.
VEEP®2 German:		
COSIVIS software German with dongle	184 523	184 523
I/O cable with SysLink connector (IEEE 488) and open wire sleeves	167 122	
I/O cable with SysLink connector (IEEE 488) on both ends, crossover		167 106
EasyPort D16 Interface box for up to 16 digital I/Os	167 121	167 121
PC data cable RS232	162 305	162 305
Manual VEEP®2 German	167 123	167 123
VEEP®2 English:		
As German, but with COSIVIS software English	184 524	184 524
Manual VEEP®2 English	167 125	167 125
VEEP®2 French:		
As German, but with COSIVIS software French	167 193	167 193
Manual VEEP®2 French	167 194	167 194
Complete VEEP®2 packages:		
VEEP®2 German single license	**167 120**	**193 805**
VEEP®2 German 6 licenses	**167 162**	**193 811**
VEEP®2 German 12 licenses	**167 163**	**193 814**
VEEP®2 English single license	**167 124**	**193 809**
VEEP®2 English 6 licenses	**167 164**	**193 812**
VEEP®2 English 12 licenses	**167 165**	**193 815**
VEEP®2 French single license	**167 195**	**193 810**
VEEP®2 French 6 licenses	**167 211**	**193 813**
VEEP®2 French 12 licenses	**167 212**	**193 816**

Note:
For multiple licenses, the appropriate number of interfaces and cables are supplied. Multiple installation if the software is handled by the dongle supplied.

preliminarie

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Training packages Electronics/PLC
Fieldbus

Offers for Fieldbus training

– AS-Interface
– Profibus DP or FMS
– Industrial IT
– Vertical integration
– Totally Integrated Automation
– ...

Whichever way you look at it: If you want to stay on the cutting edge, you have to know a lot of terms and master the basics of control engineering, including networking in the field area.
Festo Didactic offers:
– Orientation seminars for instructors and teachers
– Controllers and control units
– Valves and processes

Training with training packages
With just a few additions to the Electropneumatics and/or Electrohydraulics training packages, you can get started with Fieldbus training. The required components fit the ER frame or can be mounted on the profile plate with QuickFix.

Training with MPS®
Mechatronics specialists or IT systems electronics specialists are trained on realistic networked systems connected to office automation. The Modular Production System MPS® allows many variations of such training systems to be set up.

Industrial standard
Training is ideal if it uses components that set the standards in industry. That's why we use Festo valve terminals and Siemens controllers.

Components for Fieldbus training	Masters	Slaves/additional components	Processes
Ethernet	S7 IT EduTrainer® ER with Profibus-DP and Ethernet Master (Internet connection module)*	– Trainer Package Simatic WinCC/Web Navigator	
Profibus-DP	S7 Fieldbus EduTrainer® ER with Profibus-DP and ASi Master*	– S7 ET200S EduTrainer® ER with integrated CPU and 12E/12A as intelligent slave* – Trainer Package Touchpanel TP170A with ProTool Lite – Valve terminal with Profibus-DP connection**	– Electropneumatics, Basic level TP 201 – Electropneumatics, Advanced level TP 202 – Programmable logic controller, TP 301 – MPS® Stack magazine module – MPS® Changer module – Virtual process models VEEP®2
AS-Interface	S7 Feldbus EduTrainer® ER with Profibus-DP and ASi-Master*	– AS-Interface power supply ER* – AS-Interface connection unit ER with 2 slaves 4E/4A* – Control unit ER (membrane keyboard) with 4 control elements and 2 displays* – Valve terminal with AS-Interface connection** – Standalone valve with AS-Interface connection**	– Electropneumatics, Basic level TP 201 – Electropneumatics, Advanced level TP 202 – Programmable logic controller, TP 301 – MPS® Stack magazine module – MPS® Changer module – Virtual process models VEEP®2

* Components for the ER frame.
** Components for the profile plate.

Detailed information on request.

pneuair

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SIMATIC-CPUs for S7 EduTrainer® and S7 EduTrainer® plus	S7-CPU312-IFM	S7-CPU313	S7-CPU314	S7-CPU314-IFM	S7-CPU315	S7-CPU315-DP
RAM (KByte)	6	12	24	24	48	64
Flags	1024	1024	2048	2048	2048	2048
Counters	32	48	64	64	64	64
Timers	64	128	128	128	128	128
Digital inputs	10			20		
Digital outputs (24 V DC/0.5 A)	6			16		
Analog inputs				4		
Analog outputs				1		
Profibus DP interface						Integrated
Order no.	184 547	167 153	184 548	167 154	167 155	184 549

Digital I/O group for S7 EduTrainer® and S7 EduTrainer® plus	Digital input group S7-SM321-16E	Digital output group S7-SM322-16A	Digital I/O group S7-SM323-8E/8A
Number of inputs/outputs	16 I	16 O	8 I/8 O
Input voltage rated	24 V DC		24 V DC
Input voltage for ”1” signal	15 – 30 V DC		11 – 30 V
Input voltage for ”0” signal	-3 – +5 V		-3 – +5 V
Load voltage Nominal value	24 V DC	24 V DC	24 V DC
Output voltage for ”1” signal		24 V DC	24 V DC
Input current for ”1” signal	7 mA		6 mA
Output current for ”1” signal		0.5 A	0.5 A
Output current for ”0” signal		0.5 mA	0.5 mA
Minimum current for ”1” signal		5 mA	5 mA
Total current		2 A	2 A
Order no.	184 802	184 803	184 550

Analog I/O group for S7 EduTrainer® and S7 EduTrainer® plus	Analog input group S7-SM331-2AE	Analog output group S7-SM332-2AA	Analog I/O group S7-SM334-4E/2A
Number of inputs/outputs	2 I	2 O	4 I/2 O
Voltage (input/output)	Various ranges settable	0 – 10 V/±10 V	0 – 10 V/100 kΩ
Current (input/output)	Various ranges settable	4 – 20 mA/±20 mA	0 – 20 mA/50 kΩ
Resolution (input/output)	14-bit	12-bit	8-bit/8-bit
Order no.	184 551	187 950	184 804

Load power supply	PS 307-1B	PS 307-1E
Operating voltage	120/220 V AC	120/220 V AC
Frequency	50/60 Hz	50/60 Hz
Output voltage	24 V DC/2 A	24 V DC/5 A
Order no.	162 268	185 979

pneuaire

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Training packages Electronics/PLC

Siemens components for S7 EduTrainer®

Placeholder module	Reservation of slots for non-parameterized signal modules.	Order no. 167 175
Profibus connection module IM153-1	Transmission protocol _____ Profibus-DP to EN 50 170 Transmission rate _____ Max. 12 Mbit/s Number of modules driven _____ Max. 8 Interface _____ 9-pin Profibus Sub-D socket Supply voltage _____ 24 V DC	Order no. 167 156
Memory Card Flash-EPROM	For CPU 313/314/315/315-2DP. RAM _____ 16 KByte	Order no. 185 422
PC adapter with RS232 cable	Transmissions speed _____ Maximum 19.2 Kbit/s	Order no. 184 555
Buffer battery	Voltage _____ 3.6 V Capacity _____ 850 mAh	Order no. 184 556

pneuaire

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Training packages Electronics/PLC
Components

The technical data indicated here applies to all components (unless otherwise defined):

Pneumatic connection	Quickstar connectors QS-4 for plastic tubing PUN 4 x 0.75
Pneumatic medium	Filtered lubricated and unlubricated compressed air
Electrical connection	4 mm safety sockets or safety plugs
Voltage supply	24 V DC

Components for the mounting frame can alternatively be mounted on the profile plate with the aid of four plug-in adapters (Order no. 323 571, see chapter Accessories).

Plastic tubing, PUN 4 x 0.75

TP 101, TP 102, BIBB-P, TP 201, TP 111, PneuPos, FP 1130, TP 301

Exterior diameter	4 mm	
Interior diameter	2.8 mm	
Metallic silver	10 m	Order no. 151 496
Blue	1 m	Order no. 159 662
Black	1 m	Order no. 159 663
Yellow	1 m	Order no. 178 417
Green	1 m	Order no. 178 424
Red	1 m	Order no. 178 410

Single-acting cylinder

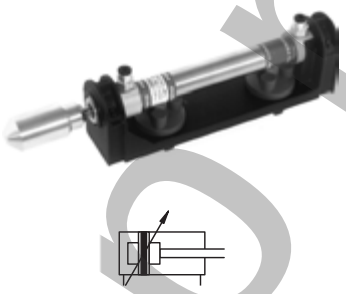
TP 101, BIBB-P, TP 201, TP 301 — Order no. 152 887

Single-acting cylinder with trip cams.

Construction	Piston cylinder
Operating pressure	Maximum 1000 kPa (10 bar)
Stroke length	Maximum 50 mm
Thrust at 600 kPa (6 bar)	150 N
Spring return force minimal	13.5 N

Double-acting cylinder

TP 101, BIBB-P, TP 201, BIBB-EP, TP 301 — Order no. 152 888



Double-acting cylinder with trip cams. The end-position cushioning can be set by means of two adjusting screws. On the piston is a permanent magnet whose magnetic field can be used to activate a proximity switch.

Construction	Piston cylinder
Operating pressure	Maximum 1000 kPa (10 bar)
Stroke length	Maximum 100 mm
Thrust at 600 kPa (6 bar)	165 N
Return thrust at 600 kPa (6 bar)	140 N

preliminary

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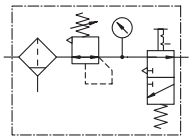
Training packages Electronics/PLC
Components

Start-up valve with filter control valve, 40 µm

TP 101, BIBB-P, TP 201, FP 1130, TP 301

Order no. 152 894



Filter control valve with pressure gauge, start-up valve, quick push-pull connectors and quick couplings, mounted on a swivel support.
The filter with water separator removes dirt, pipe sinter, rust and condensed water. The pressure control valve regulates the supply air pressure to the set operating pressure and compensates pressure fluctuations. The filter bowl has a condensate drain valve.
The start-up valve/shutoff valve ventilates and vents the entire control. The 3/2-way valve is actuated by a rotary button.

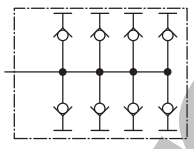
Design	Sintered filter with water trap, piston regulator valve
Nominal flow rate*	750 l/min
Input pressure	Maximum 1600 kPa (16 bar)
Working pressure	Maximum 1200 kPa (12 bar)
Grade of filtration	40 µm
Condensate quantity	14 cm^3
Connector	G 1/8, QS-6, for plastic tubing PUN 6 x 1

* Input pressure: 1000 kPa (10 bar), Operating pressure: 600 kPa (6 bar), Differential pressure: 100 kPa (1 bar).

Manifold

TP 101, BIBB-P, TP 201, TP 111, TP 301

Order no. 152 896



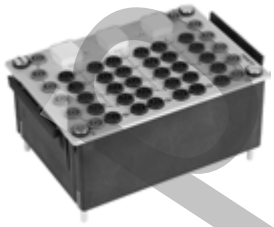
Manifold with eight self-closing non-return valves. A common manifold (QS-6 for plastic tubing PUN 6 x 1) allows supply of compressed air to the control via eight individual ports (QS-4 for plastic tubing PUN 4 x 0.75).

Connector	G 1/8

Signal input, electrical

TP 201, TP 202, BIBB-EP, TP 111, TP 601, TP 701, TP 301

Order no. 162 242



The device has an illuminated pushbutton (control switch) and two illuminated pushbuttons (momentary contact switches) with connections and two busbars for power supply.

Contact set	2 makes, 2 breaks
Contact load	Maximum 1 A
Power consumption (Miniature bulb)	0.48 W

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Preview

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Indicator unit and distributor, electrical

TP 201, BIBB-EP, TP 601, TP 602, TP 702, TP 301

Order no. 162 244

The device contains an acoustic alarm and four indicator lamps with connections and three busbars for the power supply. Through-contact socket pairs per lamp allow the element to also be used as a distributor.

Power consumption, acoustic alarm _____ 0.04 W
Power consumption, indicator lamp _____ 1.2 W
Frequency acoustic alarm_____ 420 Hz

FPC 101 Connection unit, analog

FPC EduTrainer®

Order no. 162 247

Permissible voltage fluctuation _____ 22 – 27 V DC
Reference _____ GND

Analog voltage inputs Input U _____ 4
Range_____ -10 – +10 V (max. 30 V)
Input resistance _____ 200 kΩ

Analog current inputs Input I _____ 4
Range_____ 0 – 20 mA (max. -4 – +24 mA)
Input voltage_____ Maximum ±30 V

Analog outputs _____ 2
Input voltage_____ -10 – +10 V, short-circuit-protected, maximum ±30 V, fuse-protected
Current_____ Maximum 20 mA

All data applies in connection with the FPC 101 AF programmable logic controller. In combination with an analog cable (Order no. 189 551) the unit can also be used as an analog connection unit for the S7 EduTrainer®.

PC data cable RS232

Electronics/PLC

For example, for connecting the EasyPort with the RS232 interface of the PC.

Male – Female — Order no. 162 305
Female – Female — Order no. 160 786

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Training packages Electronics/PLC
Components

Proximity switch, electronic, with cylinder attachment

TP 201, BIBB-EP, TP 301

Order no. 167 060

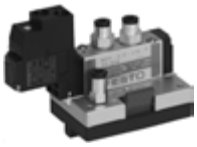
The proximity switch consists of a sensor, the mounting kit and the cable. This proximity switch emits an electrical signal when a magnetic field approaches. The switch state is shown by an LED.

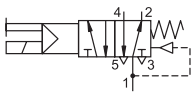
Switching voltage	10 – 30 V DC
Switching current	Maximum 200 mA
Switching power	6 W
Switch accuracy	±0.1 mm

5/2-way solenoid valve with LED

TP 201, BIBB-EP, TP 301

Order no. 167 074





The status is indicated by an LED on the housing. The valve is equipped with a manual override. The electrical connections feature polarity-reversal protection for the LED and the suppressor circuit.

Pneumatic technical data

Design	Spool valve, pilot controlled, with return spring
Pressure range	250 – 800 kPa (2.5 – 8 bar)
Response time at 600 kPa (6 bar)	On: 20 ms, Off: 30 ms
Nominal flow rate 1...2	500 l/min
Nominal flow rate 1...4	500 l/min

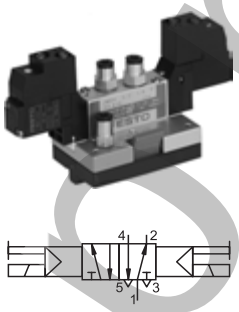
Electrical technical data

Power consumption	1.5 W
Duty cycle	100 %

5/2-way double solenoid valve with LED

TP 201, TP 202, BIBB-EP, TP 301

Order no. 167 076



The statuses are indicated by LEDs on the housings. The valve is equipped with two manual overrides. The electrical connections feature polarity-reversal protection for the LEDs and the suppressor circuits.

Pneumatic technical data

Design	Spool valve, with pilot control
Pressure range	150 – 800 kPa (1.5 – 8 bar)
Response time at 600 kPa (6 bar)	10 ms
Nominal flow rate 1...2	500 l/min
Nominal flow rate 1...4	500 l/min

Electrical technical data

Power consumption	1.5 W
Duty cycle	100 %

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I/O data cable with SysLink connectors (IEEE 488) on both ends, crossover

VEEP®2

Order no. 167 106

For connection of I/Os (SysLink) to the EasyPort.

EasyPort D16 (Interface)

VEEP®2

Order no. 167 121

Converts 16 input signals and 16 output signals (24 V) into serial data for the PC's RS-232 interface. To transmit more I/Os, up to four EasyPorts can be coupled using the fiber-optic cable supplied.

Inputs	16 digital
Outputs	16 digital
Power supply	24 V DC

I/O data cable with SysLink connector (IEEE 488) on one end and wire sleeves on the other

VEEP®2

Order no. 167 122

For connection of the EasyPorts D16 to the I/O terminals of a PLC.

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Training packages Electronics/PLC
Components

Festo PLC FEC-20DC FST | FEC EduTrainer® | Order no. 177 428

The FEC is a compact and powerful PLC and offers all functions required for automation tasks involving a few I/Os in industrial design:
– Selectable RUN/STOP switch
– 24 V DC sensor power supply
– Value input via potentiometer (such as for timers)
– Fast counter up to 4 kHz
– Multitasking (64 programs)
– 256 timers, 128 buffered
– 256 16-bit counters, 128 buffered
– 256 data registers, 128 buffered
– 10 000 flag words, 256 buffered

Digital inputs PNP/NPN	12
Signal voltage	24 V DC
Power consumption	7 mA
Signal delay	5 ms
Signal status ON	≥15 V DC
Signal status OFF	≤5 V DC
Status display	LED per stage
Operating voltage	24 V DC
Digital outputs	8 relay/NO
Load current	Maximum 2 A
Voltage	30 V DC/250 V AC
Max. switching load	80 VA inductive; 100 W resistive
Switching time	10 ms
Signal display	LED per stage

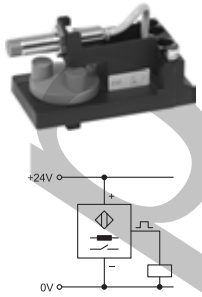
Functions:

Functions	2 x to 4 kHz
Data memory	32 kB SRAM, 2 kB buffered in flash memory
Program memory	64 kB flash memory

Accessories for programming:

Interface cable	Order no. 177 431
Software FST for IPC/FEC	(see Software chapter)

Proximity switch, inductive | TP 202, BIBB-EP, TP 602, TP 701, TP 301 | Order no. 178 574



Proximity switch that detects the approach of electrical conducting objects through a change in its inductance, emitting a signal. The proximity switch has a PNP output and is designed as a make contact. A yellow LED shows the switch state. The switch is protected against polarity reversal, overload and short-circuit.

Switching voltage	10 – 30 V DC
Nominal switching distance	4 mm (material S 235 JR)
Switching frequency	Maximum 800 Hz
Output function	Normally open contact, positive switching
Output current	Maximum 400 mA

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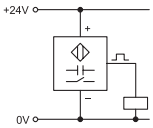
Proximity switch, capacitive

TP 202, BIBB-EP, TP 602, TP 702, TP 301

Order no. 178 575



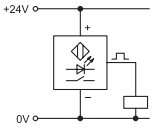
Proximity switch that detects the approach of any object through a change in capacitance, emitting a signal. The proximity switch has a PNP output and is designed as a make contact. A yellow LED shows the switch state. The switch is protected against polarity reversal, overload and short-circuit.

Switching voltage	10 – 30 V DC
Nominal switching distance	4 mm
Switching frequency	Maximum 100 Hz
Output function	Normally open contact, positive switching
Output current	Maximum 200 mA

Proximity switch, optical

TP 202, BIBB-EP, TP 602, TP 702, TP 301

Order no. 178 577



Proximity switch that responds to light signals, emitting an electrical signal. The sensing range can be adjusted by means of a potentiometer. The proximity switch has a PNP output and is designed as a make contact. A yellow LED shows the switch state. The switch is protected against polarity reversal, overload and short-circuit.

Switching voltage	10 – 30 V DC
Nominal switching distance	0 – 100 mm (adjustable)
Switching frequency	Maximum 200 Hz
Output function	Normally open contact, positive switching
Output current	Maximum 100 mA

Festo PLC FEC-FC34 MWT

FEC EduTrainer®

Order no. 191 448

Technical data as for Festo PLC FEC-20DC FST (Order no. 177 428), except:

Relay outputs	2
Transistor outputs	6
Ethernet interface	1

Accessories for programming:

Programming cable with Converter TTL-RS232	Order no. 188 935
MULTIPROG wt software	(see Software chapter)

Both the FEC Starter kit MWT and the FEC EduTrainer MWT contain the programming cable and the software (see chapter Electronics/PLC controllers).

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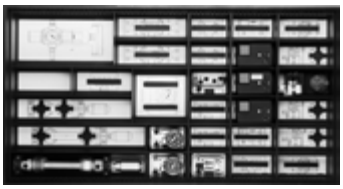
Training packages
Accessories and optional components

Equipment trays

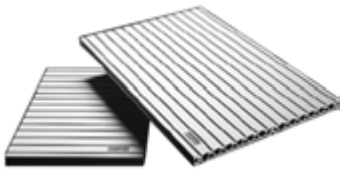
General — Order no. see equipment sets



All the parts of each equipment set in the technology packages are supplied in equipment trays. The equipment tray serves both as packaging material for transport and as a drawer insert in the workstation systems.
Also available as a modular system.

Aluminium profile plates

General



The anodized aluminium profile plate is the basis for all Festo Didactic training packages. All of the components fit securely and safely onto the profile plate.

Both sides have grooves and, if required, both sides can be equipped. The grooves are compatible with the ITEM profile system. Side caps included.

Grid dimensions	50 mm	
Size	1100 x 700 mm	Order no. 159 411
Size	550 x 700 mm	Order no. 159 409
Size	700 x 700 mm	Order no. 159 410
Size	700 x 350 mm	Order no. 162 386
Size	350 x 1100 mm*	Order no. 162 360
Size	350 x 250 mm*	Order no. 159 333
For installation on tables we recommend the appropriate rubber feet		Order no. 158 343

* Without side caps.

Slotted mounting plate

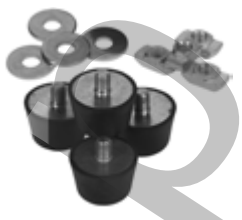
General — Order no. 159 331

Sensors and actuators from the equipment set can be mounted on this plate. The Quick-Fix system is compatible. The slotted mounting plate can be installed in the conventional A4 support frame or on the table top. Several mounting plates can be bolted together for larger setups.

Size	532 x 297 mm

Rubber feet

General — Order no. 158 343



For non-slip, protective mounting of profile plates on tabletops of any type.

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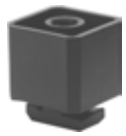
Plug-in adapter



General

For securing components with plug-in feet to the aluminium profile plate.

Order no. 323 571

Drawing template

General

The drawing templates for control technology. For rapid drawing of flow charts.

All electrical (DIN 40713), electronic (DIN 40719), pneumatic, hydraulic (DIN/ISO 1219) and logic symbols (DIN 40700) can be drawn.

Control technology template	Order no. 090 021
Program flowchart template	Order no. 090 022

Compressor

General

Order no. 091 030

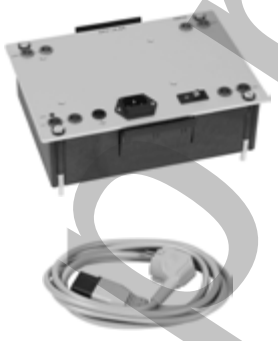
Extremely quiet compressor, noise level only 40 dB (A). Ideal for use in classrooms.

Pressure	Maximum 800 kPa (8 bar)
Free air delivery	50 l/min
Reservoir capacity	25 l
Noise level	40 dB (A) at 1 m
Electric motor	230 V/50 Hz; 0.34 kW

With mains cable, suitable for:
DE, FR, NO, SE, FI, PT, ES, AT, NL, BE, GR, TR, IT, DK, IR, ID

Accessories quick coupling socket, quick coupling plug, tubing — Order no. 102 725

Power supply unit for mounting frame



General

Input voltage	230/115 V AC (47 – 63 Hz)
Output voltage	24 V DC, short-circuit-proof
Output current	Maximum 4.5 A
Connection cable	1.3 m
Dimensions	240 x 170 x 87 mm

Without mains cable	Order no. 159 382
With mains cable, suitable for:	
DE, FR, NO, SE, FI, PT, ES, AT, NL, BE, GR, TR, IT, DK, IR, ID	Order no. 159 396
US, CA, Central America, BR, CO, YU, EC, KR, TW, TH, PH, JP	Order no. 162 411
GB, IE, MY, SG, UA, HK	Order no. 162 412
AU, NZ, CN, AR	Order no. 162 413
CH	Order no. 162 414
ZA, IN, and in some cases for GB, PT, SG, AE, HK	Order no. 162 415

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Training packages
Accessories and optional components

Tabletop power supply unit

General

Input voltage	230/115 V AC (47 – 63 Hz)
Output voltage	24 V DC, short-circuit-proof
Output current	Maximum 4.5 A
Connection cable	1.3 m
Dimensions	115 x 155 x 200 mm

Without mains cable	Order no. 162 416
With mains cable, suitable for:	
DE, FR, NO, SE, FI, PT, ES, AT, NL, BE, GR, TR, IT, DK, IR, ID	Order no. 162 417
US, CA, Central America, BR, CO, YU, EC, KR, TW, TH, PH, JP	Order no. 162 418
GB, IE, MY, SG, UA, HK	Order no. 162 419
AU, NZ, CN, AR	Order no. 162 380
CH	Order no. 162 381
ZA, IN, and in some cases for GB, PT, SG, AE, HK	Order no. 162 382

Mains cable

General

Please order **exclusively for S7 EduTrainer®**.

Suitable for:	
DE, FR, NO, SE, FI, PT, ES, AT, NL, BE, GR, TR, IT, DK, IR, ID	Order no. 247 661
US, CA, Central America, BR, CO, YU, EC, KR, TW, TH, PH, JP	Order no. 350 362
GB, IE, MY, SG, UA, HK	Order no. 350 363
AU, NZ, CN, AR	Order no. 350 364
CH	Order no. 350 366
ZA, IN, and in some cases for GB, PT, SG, AE, HK	Order no. 350 367

Digital multimeter

General — Order no. 035 681

With automatic range selection, 3½-digit.

Suitable for measurement of:
– DC/AC voltage
– DC/AC current
– Resistance
and for carrying out:
– Diode test
– Continuity tests

Oscilloscope

General — Order no. 152 917

2-channel memory oscilloscope with trigger.

Bandwidth	20 MHz
Time slot pattern	0.2 µs/cm – 0.2 s/cm
Grid amplitude	5 mV/cm – 5 V/cm

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Function generator

General

Order no. 152 918

Type of signal	Sinusoidal, square, triangular, TTL
Frequency range	0.1 Hz – 500 kHz
Voltage output	DC
Offset	-15 – +15 V
Voltage amplitude	0 – 30 V

BNC cable 4 mm

General

Order no. 152 919

Cable with BNC socket and 2 bunch plugs (4 mm). For use in conjunction with function generator and oscilloscope.

Cable BNC-BNC	Order no. 158 357
T-connector BNC	Order no. 159 298

EasyPort DA (Interface)

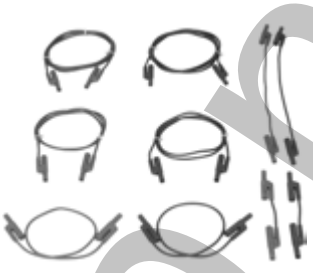
General

Order no. 193 930

Converts 16 digital input and 16 digital output signals, 4 analog input and 2 analog output signals into serial data for the PC's RS232 interface.
To increase the number of I/Os, up to four EasyPorts (including a mix with the EasyPort D16, Order no. 167 121) can be linked using the optical fibers supplied.
The status of the digital I/Os is shown on LEDs. A two-digit display can be used to display the voltage of the analog signals.

Inputs	8 digital; 24 V DC
	4 analog; 0 – 10 V, 10-bit
Outputs	8 digital; 24 V DC
	2 analog; 0 – 10 V, 10-bit

Cable set, universal



General

Flexible measuring lines, order individually or in a set.

Color	Quantity	Length [mm]	**With 4 mm safety plugs**	**With 4 mm jack-plugs**
Red	1	1500	376 941	258 252
Red	3	1000	376 939	226 400
Red	21	500	376 937	226 402
Red	26	300	376 935	227 239
Red	10	50	376 932	331 713
Blue	1	1500	376 940	258 253
Blue	3	1000	376 938	226 401
Blue	12	500	376 936	226 403
Blue	11	300	376 934	227 245
Blue	10	50	376 931	331 714
Set of cables, complete			**167 091**	**030 332**

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Training packages
Accessories and optional components

Systainer

General

Stackable interlocking case system, made of light gray plastic, with light-blue snap fasteners.

Size 1, internal dimensions (h x w x d)	72 x 377 x 277 mm	Order no. 526 714
Size 2, internal dimensions (h x w x d)	124 x 377 x 277 mm	Order no. 526 715
Size 3, internal dimensions (h x w x d)	176 x 377 x 274 mm	Order no. 526 716
Size 4, internal dimensions (h x w x d)	281 x 377 x 272 mm	Order no. 526 717
Structured foam insert for lid		Order no. 526 814

Plastic tubing, PUN 4 x 0.75

Pneumatics

Exterior diameter	4 mm	
Interior diameter	2.8 mm	
Metallic silver	10 m	Order no. 151 496
Blue	1 m	Order no. 159 662
Black	1 m	Order no. 159 663
Yellow	1 m	Order no. 178 417
Green	1 m	Order no. 178 424
Red	1 m	Order no. 178 410

PUN 3 x 0.5

Exterior diameter	3 mm	
Interior diameter	2.1 mm	
Metallic silver	5 m	Order no. 197 118

PUN 6 x 1

Exterior diameter	6 mm	
Interior diameter	4 mm	
Metallic silver	5 m	Order no. 152 963

Pipe and tube cutter

Pneumatics — Order no. 007 658

For plastic and Perbunan tubes with and without textile reinforcement for diameters up to 20 mm. Ensures vertical, burr-free cut through positive locking of tube in cutter.

Tubing cutter

Pneumatics — Order no. 255 851

For optimal cutting of plastic tubing.

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Unfastening tool — Pneumatics — Order no. 158 419

For unfastening all QS connector elements for tubing external diameters from 3 to 10 mm.

Set of sockets — Pneumatics — Order no. 525 257

(Not shown)

For the blue plug-in board. Comprising 100 sockets.

Accessory box — Pneumatics — Order no. 167 020

The accessory box contains fastening and tubing accessories and a tube cutter and unfastening tool for pneumatic connectors.

Quick Star quick push-pull connector — Pneumatics

The Quick Star quick push-pull connectors offer a range of benefits:
– Simply plug in – done
– Flexible assembly – all connectors can be rotated 360° around the threaded part
– Absolutely safe and tight – with an NBR plastic seal
– Multiple use – thread with self-sealing Teflon coating

Packs of: 10.

Straight connector, M5 (QSM-M 5-4)	Order no. 153 304
Straight connector, G1/8 (QS-G1/8-4)	Order no. 186 095
Angle connector, rotatable, M5 (QSML-M5-4)	Order no. 153 333
Angle connector, rotatable, G1/8 (QSL-G1/8-4)	Order no. 186 116
Straight connector, self-closing, M5 (QSK-M5-4)	Order no. 153 291
Straight connector, self-closing, G1/8 (QSK-G1/8-4)	Order no. 186 294
T connector (QST-4)	Order no. 153 128
Plug-in bulkhead connector (QSMS-4)	Order no. 153 376

Accessories:	
Silencer, M5	Order no. 004 645
Silencer, U 1/8	Order no. 002 307
Super seal, OL-M5	Order no. 034 634
Super seal, OL-1/8	Order no. 033 840

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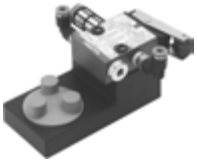
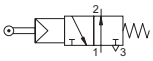
Training packages
Accessories and optional components

3/2-way roller-lever valve, normally open

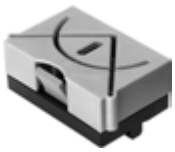


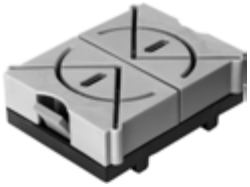


Pneumatics — Order no. 162 267

Type	Poppet valve, indirectly actuated, one side, with return spring
Pressure range	280 – 800 kPa (2,8 – 8 bar)
Normal rated flow 1...2	120 l/min

Universal adapter





Pneumatics

The adapter allows pneumatic components from Festo or third parties to be mounted on the aluminium profile plate. You can continue to use existing components and still benefit from using the aluminium profile plate systems and the patented Quick-Fix mounting system from Festo Didactic:
– Plug it, Clamp it, Done. No force required.
– No worn-out sockets.
– Exact positioning of components
– Working in the third dimension
– Universal for Festo and third-party components

You can mount the components onto the adapter yourself. It is quick, easy and reliable with groove screws (included in scope of delivery). The adapters are thus universally usable for an enormous number of components with a through-hole – regardless of the manufacturer.

Universal adapter, small	75 x 50 x 30 mm	Order no. 195 224
Universal adapter, large	75 x 100 x 30 mm	Order no. 195 225

Special mounting adapters are required for the following components:

Mounting adapter for single-acting cylinder	Order no. 159 339
Mounting adapter for double-acting cylinder	Order no. 159 340
Mounting adapter for pneumatic and electropneumatic roller lever valve	Order no. 159 342
Mounting adapter for solenoid valve	Order no. 159 347
Mounting adapter for back pressure valve	Order no. 159 350
Mounting adapter for pneumatic linear drive unit	Order no. 159 360
Mounting adapter for M18 sensors	Order no. 159 378
Plug-in adapter for ER units (4 per unit)	Order no. 323 571

Not suitable for mounting of hydraulic components.

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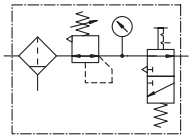
Start-up valve with filter control valve, 5 µm

Pneumatics

Order no. 526 337



Filter control valve with pressure gauge, start-up valve, quick push-pull connectors and quick couplings, mounted on a swivel support.
The filter with water separator removes dirt, pipe sinter, rust and condensed water. The pressure control valve regulates the supply air pressure to the set operating pressure and compensates pressure fluctuations. The filter bowl has a condensate drain valve.
The start-up valve/shutoff valve ventilates and vents the entire control. The 3/2-way valve is actuated by a rotary button.

Design	Sintered filter with water trap, piston regulator valve
Nominal flow rate*	1600 l/min
Input pressure	Maximum 1600 kPa (16 bar)
Working pressure	Maximum 1200 kPa (12 bar)
Grade of filtration	5 µm
Condensate quantity	43 cm^3
Connector	G 1/8, QS-6, for plastic tubing PUN 6 x 1

* Input pressure: 1000 kPa (10 bar), Operating pressure: 600 kPa (6 bar), Differential pressure: 100 kPa (1 bar).

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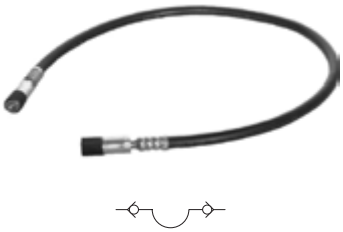
Training packages
Accessories and optional components

Hose line with quick release coupling

Hydraulics



The high-pressure hose is made of three layers. The innermost layer is synthetic rubber, followed by a wire mesh and sheath of abrasion-resistant synthetic rubber. The two coupling sockets are self-sealing when decoupled. Used with a coupling nipple, the coupling sockets form a tightly sealed connection. Only the face of the coupling is coated with oil during the coupling process. Coupling and decoupling are only possible when the hose is unpressurized.
In order to maintain the function of the hoses for a long period, they should not be twisted during installation. The minimum bending radius and operating temperature range should also be observed.
Please observe the following safety precautions: Hoses should not be used for longer than 6 years, including a storage period of two years.

Nominal size	6 mm
Operating pressure p	6 MPa (60 bar)
Max. permissible pressure p_{max}	12 MPa (120 bar)
Temperature range	-40 – +125 °C
Bending radius, minimal	100 mm

Hose length	600 mm — Order no. 152 960
Hose length	1000 mm — Order no. 152 970
Hose length	1500 mm — Order no. 159 386
Hose length	3000 mm — Order no. 158 352

Holder for storage of hydraulic hoses

Hydraulics

Order no. 159 412

The holder can accommodate up to 9 hydraulic hoses.
For wall mounting or in connection with the Learnline or Economyline workplace system. (Economyline workplaces with two hydraulic power units offer no space for mounting.)

Coupling nipple (nominal size 4)

Hydraulics

Order no. 342 047

Is required by some hydraulic valves to implement an additional function.

Mechanical connection: G¼ " (external thread)

Coupling socket (nominal size 4)

Hydraulics

Order no. 342 046

Is required by some hydraulic components to implement an additional function.
See also double nipple (Order no. 385 936).

Mechanical connection: G¼ " (internal thread)

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Double nipple

Hydraulics

Order no. 385 936

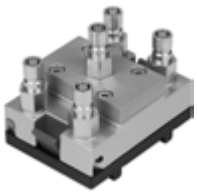
The double nipple is required for the coupling socket (Order no. 342 046).

Mechanical connection_____G¼ " (external thread)

5-way distributor without, pressure gauge

Hydraulics

Order no. 184 455



The distributor accommodates 5 P or T outlets. The tried and tested Quick-Fix mounting system allows quick installation of the distributor on the profile plate.

5-way distributor with pressure gauge

Hydraulics

Order no. 159 395

The hydraulic distributor plate accommodates 5 P or T outlets. The distributor plate is also equipped with a pressure gauge. The distributor plate is firmly mounted on the profile plate.

Pressure relief unit

Hydraulics

Order no. 152 971

The pressure relief unit allows you to remove hydraulic clamping pressures without great expenditure of force.

Accumulator filling device

Hydraulics

Order no. 092 491

Accumulator filling device for filling the hydraulic diaphragm accumulator.
The accumulator filling device can be operated directly by means of a nitrogen bottle. Vendor-specific adapters are required when using a pressure reducer for filling the reservoir.

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Training packages
Accessories and optional components

Mounting adapter

Hydraulics

Order no. 167 186

The adapter allows Festo and third-party hydraulic components to be mounted on the aluminium profile plate. You can continue to use existing components and still benefit from using the aluminium profile plate systems and the patented Quick-Fix mounting system from Festo Didactic:
– Plug it, Clamp it, Done. No force required.
– No worn-out sockets.
– Exact positioning of components
– Working in the third dimension
– Universal for Festo and third-party components

Mounting profile

Hydraulics

Order no. 119 352

Required when the weight (Order no. 152 972) is to be mounted directly on the hydraulic cylinder (Order no. 152 857). Scope of delivery includes connecting kit (the mounting profile is shown including cylinder and weight). Installation takes place on a horizontal profile plate.

Profile dimensions _____ 32 x 32 x 816 mm

Protective cover for weight — Order no. 152 973

Protective cover for weight

Hydraulics

Order no. 152 973

Provides reliable protection from injury.
Only in connection with double-acting cylinder (Order no. 152 857).

Weight — Order no. 152 972

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Hydraulic power units	**Single pump**		**Double pump**			**Special power units**			
Application	Ideal for all experiments with standard equipment sets TP 500, 600, 700, 511.		Suitable for simultaneous supply of two hydraulic circuits or to achieve high cylinder and motor speeds. Ideal for determining valve characteristics.			Specially for control hydraulics and proportional hydraulics. Other power units on request.			
Mounting (Learnline)	With mounting brackets (Order no. 158 325).		Can be integrated into Learnline workplace systems			Can be integrated into Learnline workplace systems			
Mounting (Economyline)	With mounting set (Order no. 162 225).		No integration possible.			No integration possible.			
Pump design	External gear pump		Double external gear pump			Constant-displacement pump	Adjustable-rate pump (zero-stroke pump)	Adjustable-rate pump (zero-stroke pump)	Adjustable-rate pump (Load sensing combined Q/p-adjustment)
Number of pumps	1	1	2	2	2	2	1	1	1
Motor	AC current, single-phase	AC current, single-phase	AC current, single-phase	3-phase current	3-phase current	3-phase current	AC current, single-phase	3-phase current	3-phase current
Nominal voltage	230 V	110 V	230 V	400 V	460 V	400 V	230 V	400 V	400 V
Nominal power rating	0.65 kW	0.55 kW	1.1 kW	1.1 kW	1.1 kW	1.1 kW	1.1 kW	1.1 kW	1.1 kW
Frequency	50 Hz	50 Hz	50 Hz	50 Hz	60 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Actuation: Manual via ON/OFF switch	X	X	X	X	X	X	X	X	X
Delivery rate at nominal speed	2.2 l/min at 1320 min^{-1}	2.3 l/min at 1680 min^{-1}	2 x 3.8 l/min at 1350 min^{-1}	2 x 3.8 l/min at 1450 min^{-1}	2 x 4.5 l/min at 1740 min^{-1}	2 x 5 l/min	8 l/min	8 l/min	8 l/min
Operating pressure p_{max}	6 MPa (60 bar)	6 MPa (60 bar)	6 MPa (60 bar)	6 MPa (60 bar)	6 MPa (60 bar)	On request			
Oil tank capacity	5 l	5 l	40 l	40 l	40 l	40 l	40 l	40 l	40 l
Duty cycle	50 %	50 %	100 %	100 %	100 %	On request			
Dimensions	580 x 300 x 180 mm		700 x 320 x 550 mm			On request			
Weight	19 kg	19 kg	40 kg	40 kg	40 kg	On request			
Order no.	**152 962**	**159 328**	**186 085**	**186 087**	**193 977**	**On request**			
Similar model shown									

Please note:

For safety reasons, hydraulic power units are delivered without oil. Please order hydraulic oil separately.

With mains cable, suitable for: DE, FR, NO, SE, FI, PT, ES, AT, NL, BE, GR, TR, IT, DK, IR, ID.

Hydraulic oil (DIN 51524)

Hydraulics

Brand-name hydraulic oil for all Festo hydraulic power units.

HLP22 _____10 l	Order no. 192 215
HLP22 _____20 l	Order no. 014 572
HLP32 (suitable for Order no. 030 303)____10 l	Order no. 236 301
Funnel for filling oil into devices	Order no. 374 038
Drip tray	Order no. 335 415

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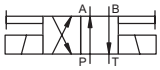
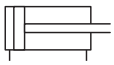
Training packages
Accessories and optional components

4/2-way double solenoid valve | Hydraulics | Order no. 525 951



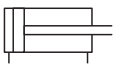
Output _____ 12 W
Operating pressure p _____ 6 MPa (60 bar)
Maximal permissible pressure p_{max} _____ 12 MPa (120 bar)
Actuation _____ Electrical

Cushioning cylinder | Hydraulics | Order no. 152 295



The cushioning cylinder is required for exercise 21 in TP 511 Closed-loop hydraulic control. It is mounted directly on the linear drive.

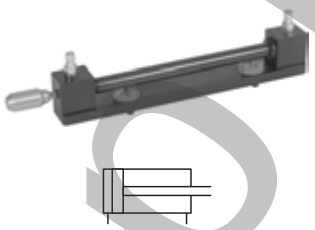
Double-acting cylinder, 25/18/200 | Hydraulics | Order no. 184 490



Matching potentiometer: Order no. 167 090. The potentiometer is mounted on the cylinder using the assembly kit (Order no. 525 955).

Piston diameter _____ 25 mm
Piston rod diameter _____ 18 mm
Stroke _____ 200 mm
Surface ratio _____ 1 : 1.9

Double-acting cylinder, 16/10/300 | Hydraulics | Order no. 184 489



Matching potentiometer: Order no. 525 953. The potentiometer is mounted on the cylinder using the assembly kit (Order no. 525 952).

Piston diameter _____ 16 mm
Piston rod diameter _____ 10 mm
Stroke _____ 300 mm

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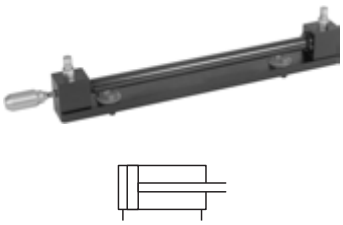
Double-acting cylinder, 16/10/400

Hydraulics

Order no. 184 488



Matching potentiometer: Order no. 525 954. No assembly kit is required for mounting on the cylinder.

Piston diameter _____ 16 mm
Piston rod diameter _____ 10 mm
Stroke _____ 400 mm

Assembly kit for cylinder
25/18/200 (Order no. 184 490)
16/10/300 (Order no. 184 489)

(Not shown)

Hydraulics

This assembly kit is for mounting of the guide ruler for actuation of the cam of the 2/2-way stem-actuated valve.

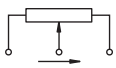
For cylinder (Order no. 184 490) — Order no. 525 955
For cylinder (Order no. 184 489) — Order no. 525 952

Mounting:
Cheese-head screws _____ M4
Lock nut _____ M8

Linear potentiometer, 300 mm stroke

Hydraulics

Order no. 525 953



The assembly kit (Order no. 525 952) is required for mounting the linear potentiometer on the hydraulic cylinder (Order no. 184 489).

Connection cables:
Supply voltage _____ 13 – 30 V DC
Output voltage _____ 0 – 10 V DC

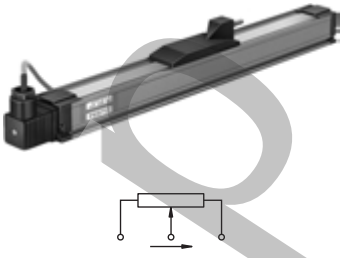
Potentiometer:
Measuring stroke _____ 300 mm

Mechanical attachment
of connecting rod _____ Thread M 4

Linear potentiometer, 450 mm stroke

Hydraulics

Order no. 525 954



No assembly kit is required for mounting the linear potentiometer on the hydraulic cylinder. (Order no.184 488).The linear potentiometer is mounted on the aluminium profile plate.

Connection cables:
Supply voltage _____ 13 – 30 V DC
Output voltage _____ 0 – 10 V DC

Potentiometer:
Measuring stroke _____ 450 mm

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Training packages
Accessories and optional components

Measuring case

Hydraulics

Order no. 177 468

The complete measuring set is packaged in practical, sturdy Systainer that is also ideal for other third-party components. The measuring set can be used for commissioning, maintenance, troubleshooting and optimization of hydraulic circuits as well as in pneumatics and process engineering. The contents include various sensors, a universal display, a stopwatch and comprehensive operating instructions.

Consisting of:

Flow measurement device (0 – 10 l/min) in combination with hydraulic motor (Order no. 152 858)	Order no. 183 736
Cable, USD	Order no. 167 092
Measuring line, 500 mm, red	Order no. 376 937
Measuring line, 500 mm, blue	Order no. 376 936
Universal display	Order no. 183 737
Pressure sensor, Measuring range 0 – 100 bar (nominal size 4)	Order no. 525 964
Temperature sensor, Measuring range 0 – 100 °C (nominal size 4)	Order no. 525 963

Universal display

Hydraulics

Order no. 183 737

Display	4-digit, LCD
Inputs	SP1: DC voltage 0 – 10 (30) V SP2: DC current 0 – 20 mA SP3: Pt100- resistance thermometer SP4: NiCr-Ni thermocouple
Characteristics	10 defined channels for standard pressure temperature and flowrate sensors, 4 user-programmable
Temperature range	0 – 50 °C
Power supply	9V standard batteries IEC6F22 or stabilized 24V power supply
Scope of delivery	With operating instructions and 24-V connection cable

---

Pressure sensor

Hydraulics

Permissible operating voltage	15 – 30 V DC
Voltage output	0 – 10 V
Measuring range	0 – 100 bar
Cut-off frequency	1 kHz

Connection parts nominal size 4	Order no. 525 964
Connection parts nominal size 6	Order no. 196 979

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Temperature sensor

Hydraulics

Permissible operating voltage _____ 20 – 30 V DC
Voltage output _____ 0 – 10 V
Measuring range _____ 0 – 100 °C
Cut-off frequency _____ 1 kHz

Connection parts nominal size 4 — Order no. 525 963
Connection parts nominal size 6 — Order no. 196 978

Measuring container for hydraulics

Hydraulics

Order no. 162 344

Flowrate measurement can be clearly, simply and dramatically demonstrated with the transparent measuring container. The scale of the transparent measuring container allows simple measurement through measured removal.
Please note: The measuring container cannot be used in connection with the hydraulic power units Order no. 152 962 and Order no. 159 328 or in connection with Economyline workplace systems.

Hydraulic slide rule

Hydraulics

Order no. 032 195

This hydraulic slide rule provides an ideal means of calculating force, travel time, energy consumption, delivery rates etc.

Set of sockets

Hydraulics

Order no. 525 258

(Not shown)

For the blue plug-in board. Comprising 100 sockets with chuck.

Vernier caliper

Sensors

Order no. 035 653

Measuring range _____ 0 – 150 mm
Resolution _____ 0.01 mm
Display _____ LCD display, 5-digit
Power supply _____ 1.5 V button cell

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Training packages
Accessories and optional components

I/O data cable with SysLink connectors (IEEE 488) on both ends

Electronics/PLC

Order no. 034 031

For connection of SysLink interfaces, for example an EduTrainers® PLC with the universal connection unit, digital (Order no. 162 231).

I/O data cable with one SysLink connector as per IEEE 488 and bare cable-end sleeves

Electronics/PLC

Order no. 167 122

For connecting the EasyPort D16 to the I/O terminals of a PLC.

I/O data cable

Electronics/PLC

Order no. 167 197

– Connection of a PLC board to an MPS® Station with EasyPort D16 (Order no. 167 121) for control of simulated stations in COSIVIS (VEEP®2).
– Adapter cable for connecting: any PLC – open I/O data cable (Order no. 167 122) – universal connection unit (Order no. 162 231).

I/O data cable, analog

Electronics/PLC

Order no. 189 551

For connection of analog connector to the PLC EduTrainers® using the analog connection unit (Order no. 162 247).

PC loading cable

Electronics/PLC

Order no. 014 613

Connection between the PLC FPC 101 and the serial port.

PC data cable RS232

Electronics/PLC

For example, for connecting the EasyPort to the RS232 port of a PC.

Male – Female — Order no. 162 305
Female – Female — Order no. 160 786

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PC adapter/RS 232 cable | Electronics/PLC | Order no. 184 555

Programming cable for the Simatic S7.

Profibus cable | Electronics/PLC

Connection between 2 Profibus stations.

Length _____ 0.5 m — Order no. 350 411
Length _____ 3 m — Order no. 350 412

SysLink coupling | Electronics/PLC | Order no. 380 284

(Not shown)

For connecting the PLC board of an MPS® station to the EasyPort D16 via the I/O data cable (Order no. 167 106).

Plug-in adapter, electrical | Electronics/PLC | Order no. 185 692

Adapter for inserting cables with safety plugs into sockets without shock-hazard protection. This is no longer compliant with DIN EN 61010 (IEC 1010).
Set of 10 adapters.

EasyPort D16 (Interface) | Electronics/PLC | Order no. 167 121

Converts 16 digital input and 16 digital output signals into serial data for the PC's RS232 interface. To increase the number of I/Os, up to four EasyPorts can be linked using the optical fibers supplied.

Inputs _____ 16 digital
Outputs _____ 16 digital
Power supply _____ 24 V DC

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Training packages
Accessories and optional components

Simulation box (8I/8O) (SysLink)

Electronics/PLC

Order no. 170 643

The simulation box allows simulation of input signals and display of output signals of an MPS® Station or PLC. Two types of application are possible:
– Simulation of input for testing a PLC program.
  This requires I/O data cable (Order no. 034 031).
– Setting of outputs (with separate 24 V supply) to allow operation of an MPS station. The required cable (Order no. 167 106) is included in the scope of delivery.

Connector type _____ 24-pin

Universal connection unit, digital (SysLink)

Electronics/PLC

Order no. 162 231

The universal connection unit connects all 4 mm safety plugs with the 24-pin system connector as per IEEE 488 (SysLink). This thus becomes a universal interface between units with 4 mm connection technology and devices equipped with SysLink connectors as per IEEE488:
– Connection to an I/O terminal of an MPS® station via an I/O cable with SysLink connectors on both ends
– I/O coupling via the 4 mm laboratory connectors of a PLC using an open I/O cable (IEEE488 connector – bare wires)
– Simple connection of actuators and sensors via 4 mm laboratory connectors with the interface unit EasyPort for FluidSIM®

Inputs _____ 3 safety sockets each for 8 three-wire sensors
Outputs _____ 2 safety sockets each for 8 actuators
Connections _____ 4 mm safety sockets for 24 V DC, SysLink connector (IEEE488)
I/O status display _____ via LED

Sensor tester

Electronics/PLC

Order no. 158 481

The sensor tester speeds up commissioning of systems with integrated sensors and proximity switches. It can be used for:
– Quick and simple checking of contacts
– Rapid fine adjustment
– Unambiguous detection of switch outputs

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Workstation systems

Learnline and Economyline

The concept of the modular training environment for basic and further training.
With many practical details to make learning easier.

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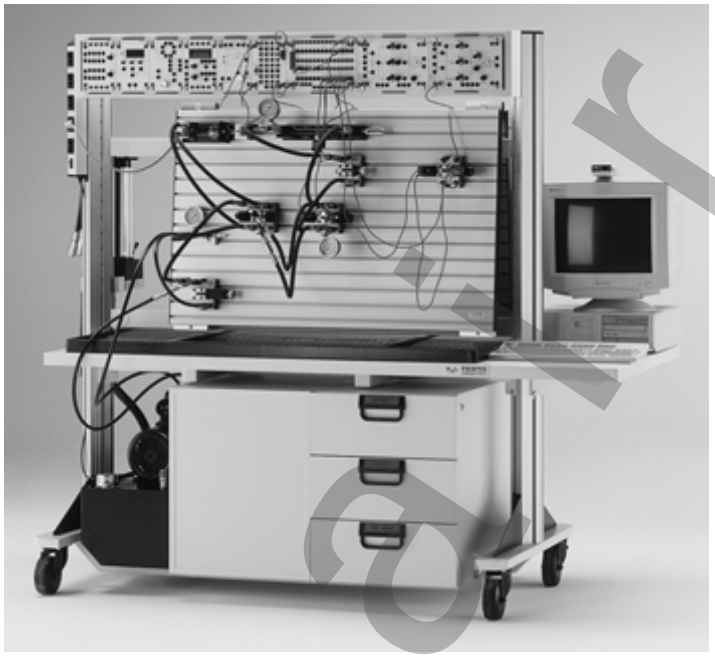
Workstation systems

Learnline – The yardstick for design and function



Economyline – The low-cost training environment for vocational training

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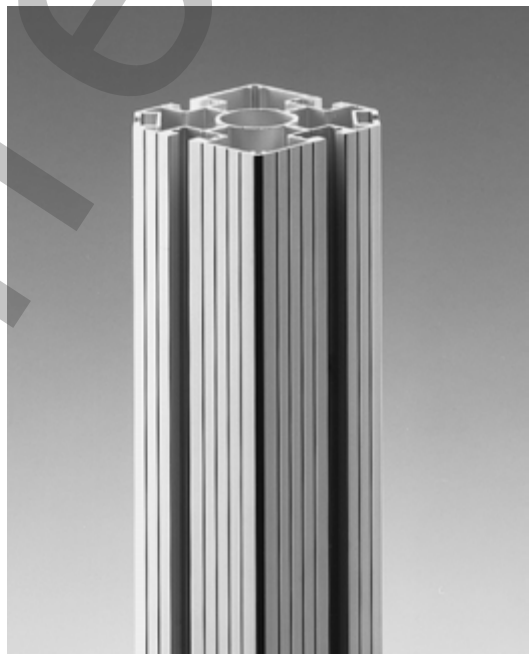
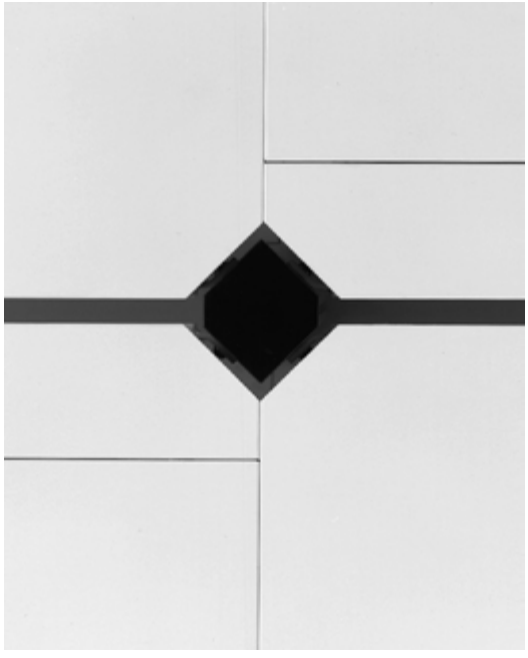
Just a glance at its basic structure is enough to see that the various elements of the Learnline furniture range can be combined to meet any requirements. With just a few carefully thought-out individual components, it is possible achieve results which are geared to the people's needs, space available and technical requirements. Learnline consists of basic mobile or stationary units with or without cable ducts, various assembly units, wheeled or suspended drawer units for storage, and a wide range of accessories. A mobile instructor's table and a stationary worktable are also available.

The intelligent design of the profile column provides the key to the modular structure of the Learnline system by Festo Didactic. As the central point of connection, it opens up countless possibilities for the required configurations. Components mounted above the table top are secured at the correct height for each individual.
The top is sealed by a cover plate and an adjustable foot plate is located underneath. Even large mechanical forces, resulting from servohydraulics, proportional pneumatics or the use of robots for example do not present a problem for Learnline. The distortion-resistant design ensures an extremely long service life despite large loads.





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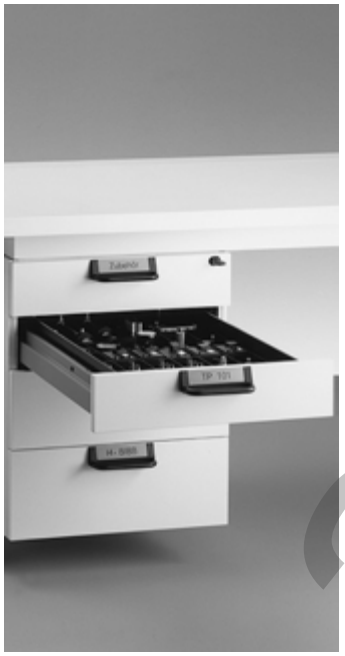
Workstation systems
Learnline

Integrated solutions for all qualification needs

Learnline places at your disposal a universal storage system for all areas of training and further training, research and teaching. The attention paid to design and function as one essential feature is evident in every detail.



The Learnline units have been specifically designed for orderly storage. Their sturdy design is just the thing for use in training workshops, technical facilities, research laboratories, etc.
The transport packaging for the Pneumatic and Hydraulic equipment sets can also be used as drawer inserts for storing components in the units. Yet another benefit which saves material and avoids unnecessary waste.

Of major advantage in a technical environment are the units with integrated cable duct: electrical cables and compressed air lines are housed in the correct position and cannot interfere with practical work. An integral cover seals the cable duct.
Where storage is concerned the various units in the Learnline workstation system are also indispensable in the laboratory, classroom and training workshop. To round out the range, units can be equipped with a component-specific storage system.

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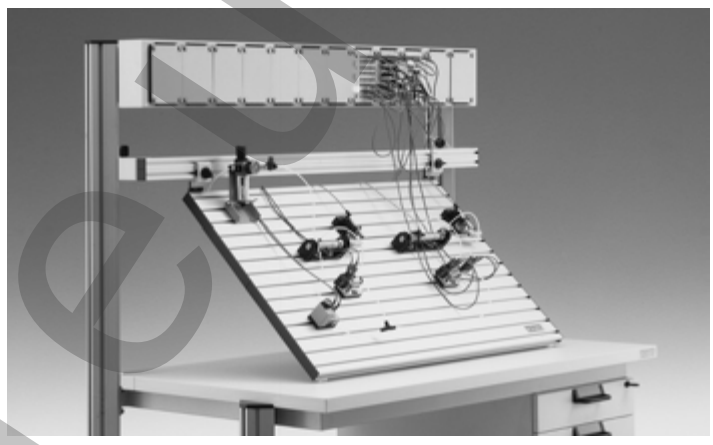
The stationary workstations

The perfect combination of two stationary work tables to form two workstations.

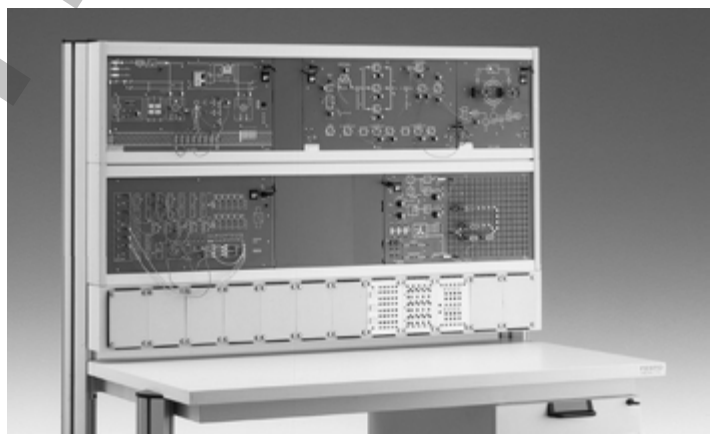
The two central profile columns are sufficient to connect the table tops. A4 and ER mounting frames can be integrated between the profile columns. Worktables can be supplied with or without cable ducts. The units with steel drawers are available in various dimensions and designs, either on castors or suspended under the table top. Up to two units can be fitted underneath each workstation.

Workstation equipped with one ER mounting frame.



The ER mounting frame accomodates up to 11 ER training units by Festo Didactic. All of them are clearly visible and easily accessible. The tried and tested profile plate – equipped in this example with Pneumatic components – has been attached to the inclination unit at the top. Thus, the angle of the profile plate can be infinitely adjusted until it reaches a horizontal position; the layout of the exercise is therefore always ergonomically correct. When the profile plate is inclined, it creates a useful area at the front of the table top.

Workstation equipped with two A4 mounting frames and one ER mounting frame.



The A4 mounting frame conforms to the electrotechnical standard. The ER mounting frame is compatible with the hardware from Festo Didactic training packages.

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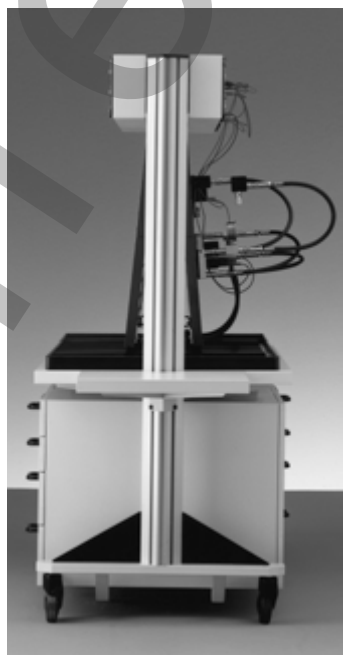
Workstation systems
Learnline

The mobile workstations

With its mobile workstations, the Learnline system is able to meet any requirements for high mobility and optimum use of space. Individual or group training workstations can be created with a minimum of effort wherever they are required. Transport via elevator is also possible.

This mobile workstation is designed in such a way as to permit several people to work or to carry out exercises simultaneously. The training components in the ER mounting frame are clearly arranged and networked. The industrial components are arranged systematically on the extensive profile plate; a didactic and ergonomic arrangement which is conducive to productive group training.
The compartments in the suspended drawer units on both sides of the workstation ensure quick and easy access to the equipment sets. A plastic drip tray for hydraulic applications ensures reliable and clean operation. The quiet and smoothly running castors are all freely movable and two are fitted with a lockable brake.



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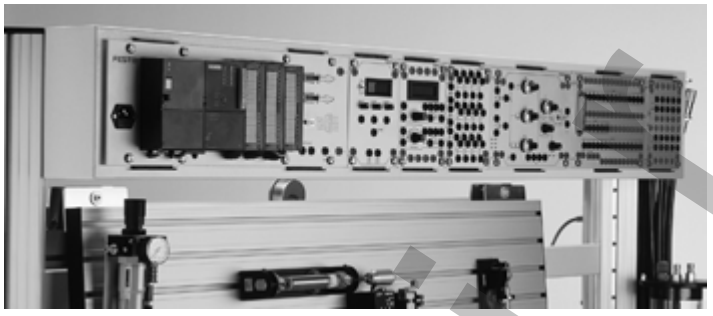
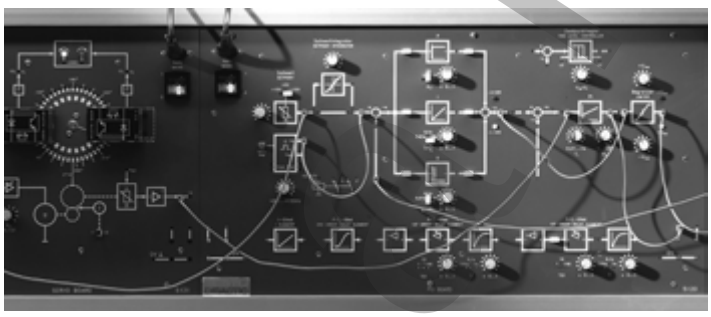
Compact component units for high-level integrated training

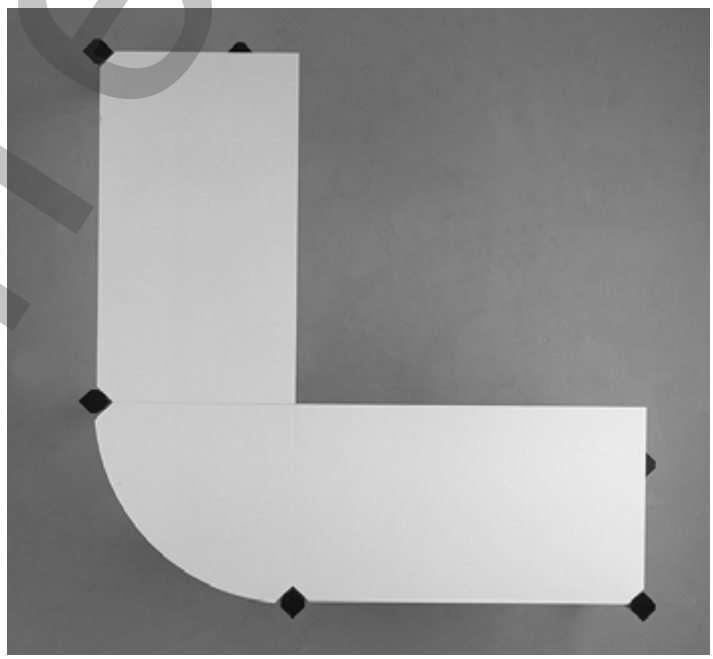
The mounting frames for the workstations are designed to hold a large number of exercise boards and ER units from the Learning System for Automation. This compatibility also extends to electrotechnical equipment produced by other manufacturers.
It is thus possible to obtain a satisfactory solution to almost any specific task. Measuring and control technology form an integral part of 'our world of training': visible proof of what we understand to be an complete modular concept.





Learnline – A whole new world of training

Better training results and increased competence demand that trainees are able to operate in an environment which corresponds to their needs and abilities. On the other hand, the training environment should accommodate didactic requirements, given objectives and local conditions.
This is why Festo has designed the overall concept of the Learnline workstation system for systematic expansion. The result is our new 'world of training', in which people and technology form a constructive team.
Additional combination elements (some as special versions) offer an unlimited range of design possibilities.



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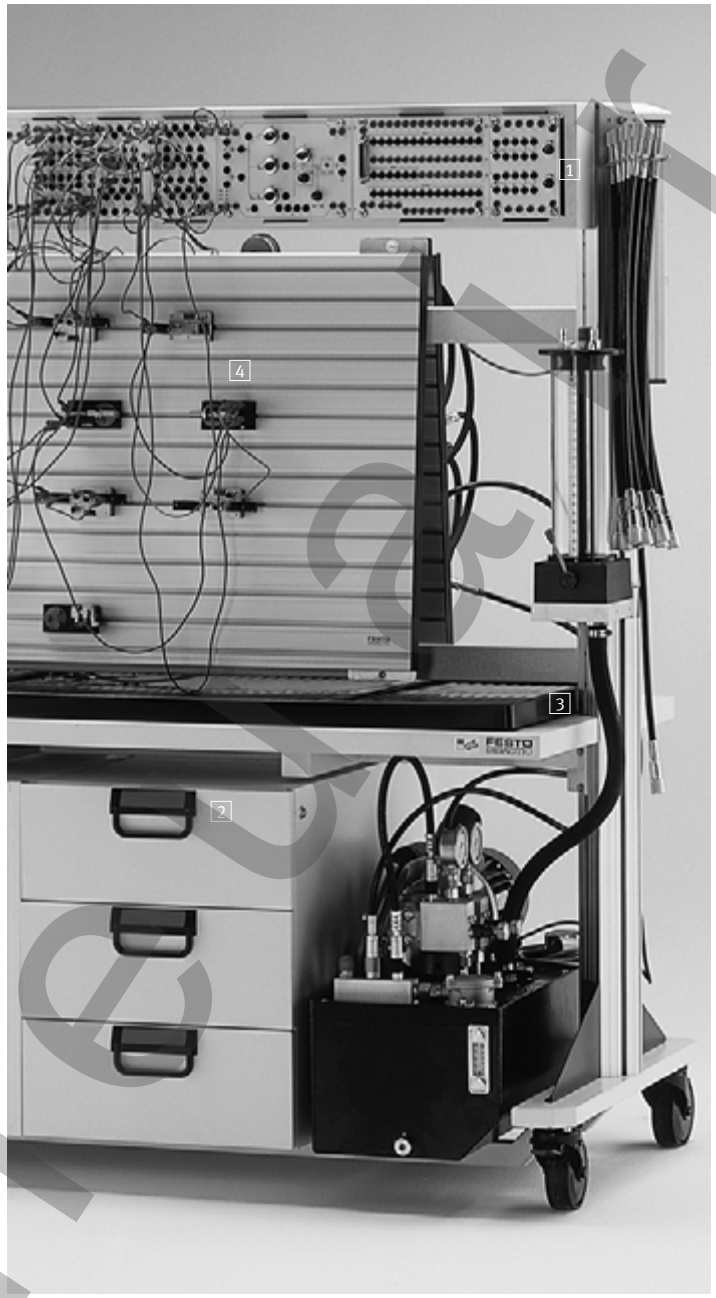
Workstation systems
Learnline

Create your own personal world of learning

The modular workstation system Learnline offers a variety of possibilities for both furnishing and training. Competent consultants are available in over 50 countries to supply you with an individual quotation.



Or you can simply put together your own individual workstation system:

– Decide which basic worktable you need: mobile or stationary.

– Select a mounting frame: either for ER units or the A4 format in accordance with the electrotechnical standard.
1

– The drawer units: The perfect means to store your equipment sets. Order the standing drawer unit for the basic mobile worktable and the suspended drawer unit for the basic stationary worktable.
2

– Table extension, drip tray and much more: complete your workstation system with an extensive range of accessories.
3

– Using the appropriate extension and connecting elements for the basic stationary worktables you can create a made-to-measure training room.

– The corresponding equipment sets, exercise boards, courseware and software make the Learning System for Automation perfect.
4

preliminary

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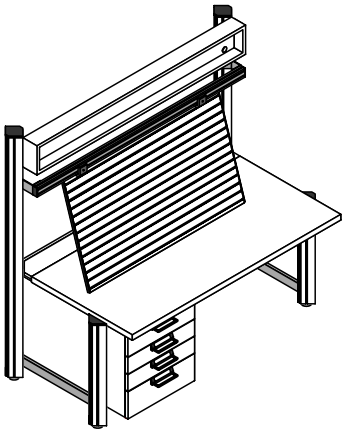
Workstation systems
Learnline – Complete systems

Stationary workstation,
with integrated cable duct, pneumatic



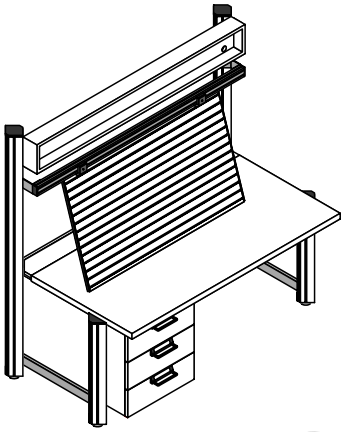
Components	Quantity	Order no.
Basic stationary unit	1	152 957
Suspended drawer unit with 4 drawers*	1	158 278
Inclination unit for profile plate	1	158 329
Aluminium profile plate**	1	159 411
ER mounting frame	1	152 948
Workstation, complete		**167 272**

(Descriptions: chapter Learnline – Components and accessories)

* Drawer unit not suitable for hydraulic components.

** Technical data and descriptions: chapter Training packages – Accessories.

Stationary workstation,
with integrated cable duct, hydraulic

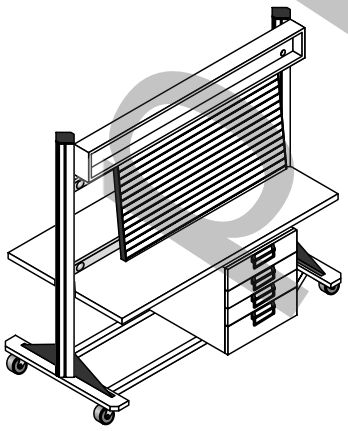


Components	Quantity	Order no.
Basic stationary unit	1	152 957
Suspended drawer unit with 3 drawers	1	158 280
Inclination unit for profile plate	1	158 329
Aluminium profile plate*	1	159 411
ER mounting frame	1	152 948
Workstation, complete		**167 273**

(Descriptions: chapter Learnline – Components and accessories)

* Technical data and descriptions: chapter Training packages – Accessories.

Mobile workstation,
for one-sided use, pneumatic



Components	Quantity	Order no.
Basic mobile unit	1	158 268
Standing drawer unit with 4 drawers*	1	158 284
Set of horizontal braces for mounting the profile plate	1 set	158 332
Mounting for profile plate, 85° inclination	1	158 327
Aluminium profile plate**	1	159 411
ER mounting frame	1	152 948
Workstation, complete		**167 274**

(Descriptions: chapter Learnline – Components and accessories)

* Drawer unit not suitable for hydraulic components.

** Technical data and descriptions: chapter Training packages – Accessories.

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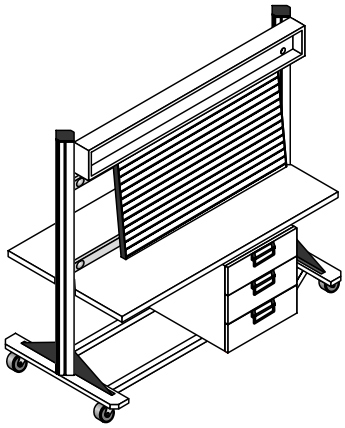
Workstation systems

Learnline – Complete systems

Mobile workstation,
for one-sided use, hydraulic

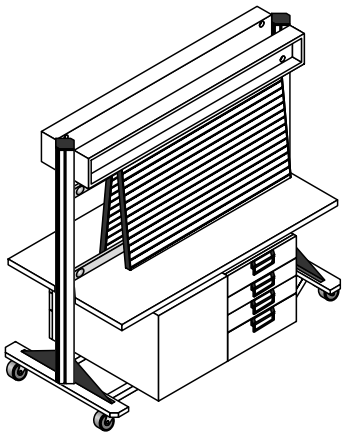


Components	Quantity	Order no.
Basic mobile unit	1	158 268
Standing drawer unit with 3 drawers	1	158 286
Set of horizontal braces for mounting the profile plate	1 set	158 332
Mounting for profile plate, 85° inclination	1	158 327
Aluminium profile plate*	1	159 411
ER mounting frame	1	152 948
Workstation, complete		**167 275**

(Descriptions: chapter Learnline – Components and accessories)

* Technical data and descriptions: chapter Training packages – Accessories.

Mobile workstation,
for two-sided use, pneumatic



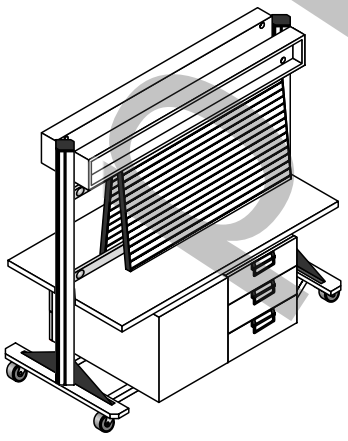
Components	Quantity	Order no.
Basic mobile unit	1	158 268
Standing drawer unit with 4 drawers*	2	158 284
Set of horizontal braces for mounting the profile plate	1 set	158 332
Mounting for profile plate, 85° inclination	2	158 327
Aluminium profile plate**	2	159 411
ER mounting frame	2	152 948
Workstation, complete		**167 276**

(Descriptions: chapter Learnline – Components and accessories)

* Drawer unit not suitable for hydraulic components.

** Technical data and descriptions: chapter Training packages – Accessories.

Mobile workstation,
for two-sided use, hydraulic



Components	Quantity	Order no.
Basic mobile unit	1	158 268
Standing drawer unit with 3 drawers	2	158 286
Set of horizontal braces for mounting the profile plate	1 set	158 332
Mounting for profile plate, 85° inclination	2	158 327
Aluminium profile plate*	2	159 411
ER mounting frame	2	152 948
Workstation, complete		**167 277**

(Descriptions: chapter Learnline – Components and accessories)

* Technical data and descriptions: chapter Training packages – Accessories.

Preview

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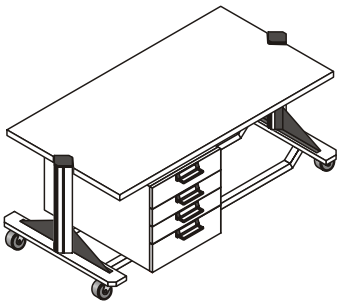
Mobile worktable

Order no. 158 315



Mobile worktable with anodized aluminum profiles, powder-coated steel frame and sturdy 40 mm working surface. All wheels freely movable with lockable brake.
1 standing container for equipment sets, 4 steel drawers with a useful depth of 700 mm and useful width of 375 mm, useful height 3 x 100 mm and 1 x 150 mm, fully extending, lockable, load carrying capacity up to 20 kg per drawer, drawer front can be labelled, lock on side.

External dimensions:

Width	1590 mm
Depth	785 mm
Height	780 mm

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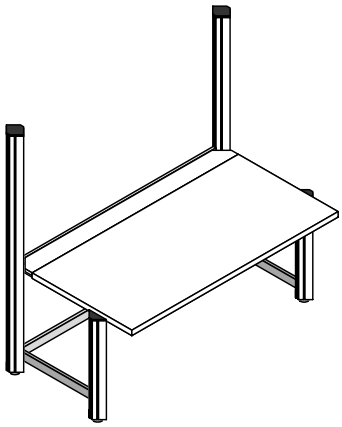
Workstation systems
Learnline – Basic units

Basic stationary unit

Basic unit



Basic stationary unit with anodized aluminium profiles, powder-coated steel frame and a sturdy 40 mm work surface.

External dimensions:
Width _____ 1590 mm
Depth _____ 910 mm
Height _____ 1750 mm

Working surface:
Width _____ 1490 mm
Depth _____ 840 mm
Height _____ 780 mm

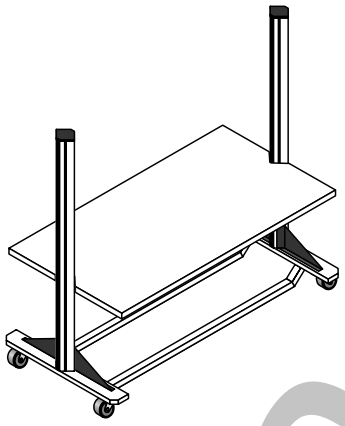
With integrated cable duct — Order no. 152 957
Without integrated cable duct — Order no. 152 956

Optional: max. 2 suspended drawer units. For dimensions and features: see chapter Learnline – Components and accessories.

Basic mobile unit

Basic unit

Order no. 158 268



Basic mobile unit with anodized aluminium profiles, powder-coated steel frame and a sturdy 40 mm work surface. All wheels freely movable, two wheels with lockable brake.

External dimensions:
Width _____ 1590 mm
Depth _____ 785 mm
Height _____ 1800 mm

Working surface:
Width _____ 1490 mm
Depth _____ 785 mm
Height _____ 780 mm

Optional: max. 2 standing drawer unit. For dimensions and features: see chapter Learnline – Components and accessories.

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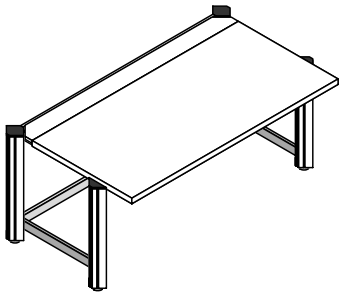
Stationary workstation

Basic unit



Stationary worktable with anodized aluminium profiles, powder-coated steel frame and a sturdy 40 mm work surface.

External dimensions:
Width _____ 1590 mm
Depth _____ 910 mm
Height _____ 780 mm

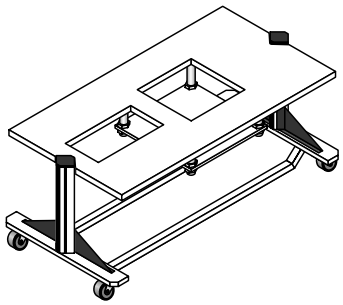
Working surface:
Width _____ 1490 mm
Depth _____ 840 mm
Height _____ 780 mm

With integrated cable duct — Order no. 152 943
Without integrated cable duct — Order no. 152 941

Optional: max. 2 suspended drawer units. For dimensions and features: see chapter Learnline – Components and accessories.

Mobile instructor's table

Basic unit — Order no. 158 331



Mobile instructor's worktable with anodized aluminium profiles, powder-coated steel frame and sturdy 40 mm work surface. All wheels freely movable, two wheels with lockable brake. Tabletop with cutouts for power supply unit for hydraulic transparent models (Order no. 030 303) and overhead projector (Order no. 158 356).

External dimensions:
Width _____ 1590 mm
Depth _____ 785 mm
Height _____ 780 mm

Working surface:
Width _____ 1490 mm
Depth _____ 785 mm
Height _____ 780 mm

Optional: max. 1 standing drawer unit. For dimensions and features: see chapter Learnline – Components and accessories.

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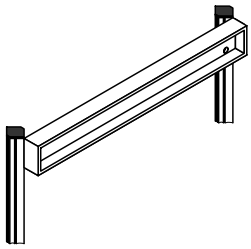
Workstation systems

Learnline – Components and accessories

ER mounting frame

Mounting frames

Order no. 152 948

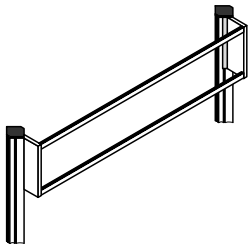


Length _____ 1490 mm

A4 mounting frame

Mounting frames

Order no. 152 949



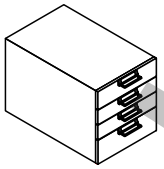
Length _____ 1490 mm

Suspended drawer unit for stationary workstations, suitable for equipment sets

Drawer units

Drawers made of steel, fully extending, safety stop. Drawer fronts can be labelled.
Load 20 kg per drawer.

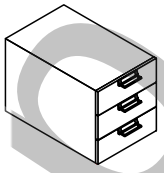
Width (external) _____ 475 mm
Useful width _____ 375 mm
Depth (external) _____ 752 mm
Useful depth _____ 700 mm
Height (external) _____ 590 mm



Installation front Type 1
Drawers quantity: 4
Useful height of drawers: 100/150 mm
(not suitable for hydraulic equipment sets)

Left: H1L
Right: H1R

Order no. 158 278
Order no. 158 279



Installation front Type 2
Drawers quantity: 3
Useful height of drawers: 150 mm

Left: H2L
Right: H2R

Order no. 158 280
Order no. 158 281

The following drawer unit combinations are possible (one drawer unit on each side of workstation):

	H1L	H1R	H2L	H2R
H1L		•		•
H1R	•		•	
H2L		•		•
H2R	•		•	

24-month Festo Didactic warranty

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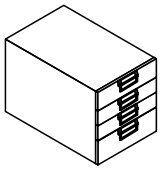
Standing drawer unit for mobile workstations, suitable for equipment sets

Drawer units

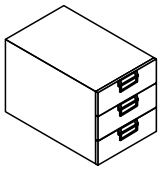
Technical data as for suspended draw units for stationary workstations.



Installation front Type 1
Drawers quantity: 4
Useful height of drawers: 100/150 mm (not suitable for hydraulic equipment sets)

Left: F1L
Right: F1R

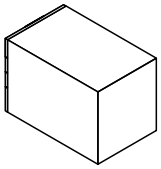
Order no. 158 284
Order no. 158 285



Installation front Type 2
Drawers quantity: 3
Useful height of drawers: 150 mm

Left: F2L
Right: F2R

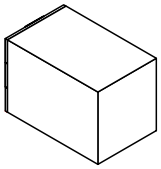
Order no. 158 286
Order no. 158 287



Installation rear Type 1
Drawers quantity: 4
Useful height of drawers: 100/150 mm (not suitable for hydraulic equipment sets)

Left: 1RL
Right: 1RR

Order no. 158 285
Order no. 158 284



Installation rear Type 2
Drawers quantity: 3
Useful height of drawers: 150 mm

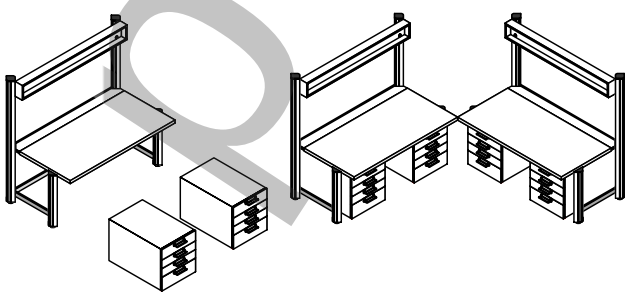
Left: 2RL
Right: 2RR

Order no. 158 287
Order no. 158 286

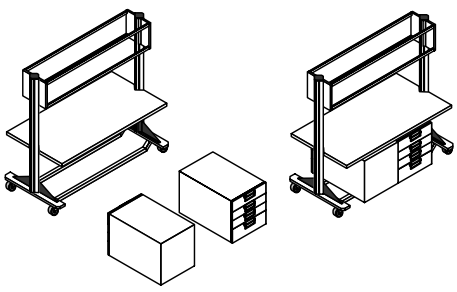
The following drawer unit combinations are possible (one drawer unit on each side of workstation):

	F1L	F1R	F2L	F2R	1RL	1RR	2RL	2RR
F1L						•		•
F1R					•		•	
F2L						•		•
F2R					•		•	
1RL		•		•				
1RR	•		•					
2RL		•		•				
2RR	•		•					

Installation examples



Stationary workstation with suspended drawer units H1L und H1R.



Mobile workstation with standing drawer unit 1RL und F1R.

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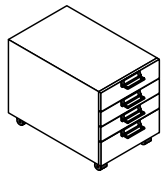
Workstation systems
Learnline – Components and accessories

Wheeled drawer unit for equipment sets

Drawer units

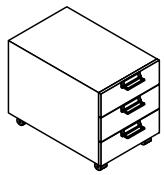
Lockable steel drawers. Fully extending, lockable, safety stop, drawer fronts can be labelled. Load 20 kg per drawer. All wheels freely movable, 2 wheels with lockable brake.

Width (external) _____ 475 mm
Useful width _____ 375 mm
Depth (external) _____ 762 mm
Useful depth _____ 700 mm
Height (external) _____ 660 mm



Drawers quantity: 4
Useful height of drawers: 100/150 mm
(not suitable for hydraulic equipment sets)

Order no. 158 272



Drawers quantity: 3
Useful height of drawers: 150 mm

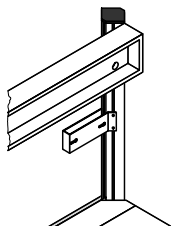
Order no. 158 273

Mounting bracket for hydraulic power unit

General accessories

Order no. 158 325

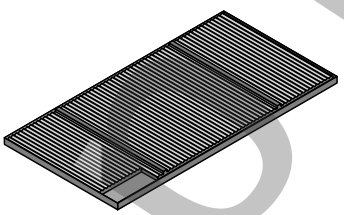
Allows installation of hydraulic power unit (Order no. 152 962, 159 328) to vertical profile column.



Drip tray

General accessories

Order no. 335 415



Width _____ 1380 mm
Depth _____ 720 mm
Height _____ 42 mm

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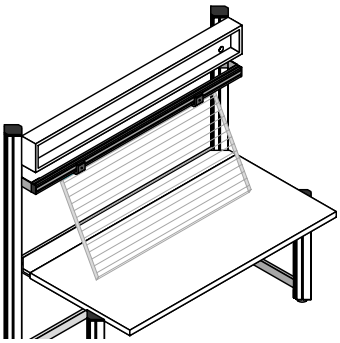
Inclination unit for profile plate

Accessories for stationary workstations

Order no. 158 329

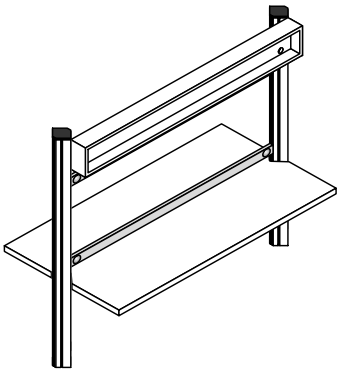


With one ER mounting frame _____0°– 80°
With one A4 mounting frame _____0°– 50°

Set of horizontal braces

Accessories for mobile workstations

Order no. 158 332

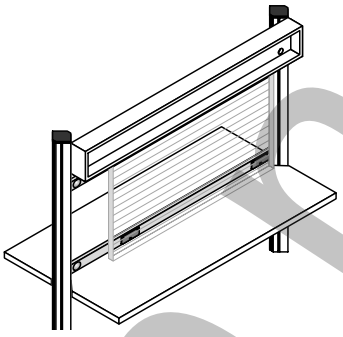


Required for mounting aluminium profile plate.

Mounting for profile plate, vertical

Accessories for mobile workstations

Order no. 158 326



Only for ER mounting frame (for two-sided mount, please order 2).

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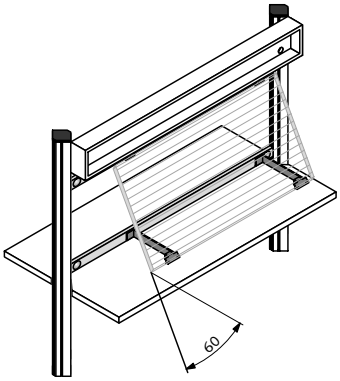
Workstation systems
Learnline – Components and accessories

Mounting for profile plate, 60° inclination

Accessories for mobile workstations

Order no. 158 328

For 1 DIN A4 or ER mounting frame (for two-sided mount, please order 2).



Mounting for profile plate, 85° inclination

Accessories for mobile workstations

Order no. 158 327

Only for ER mounting frame (for two-sided mount, please order 2).

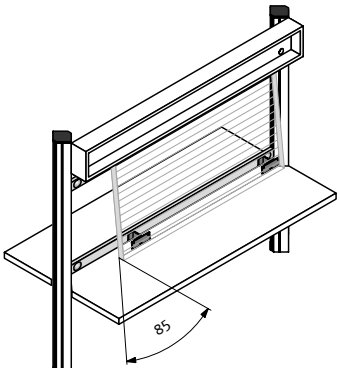
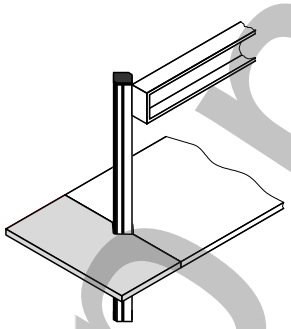


Table extension left or right

Accessories for mobile workstations

Order no. 158 323

Tabletop 400 x 785 mm, 40 mm thick.



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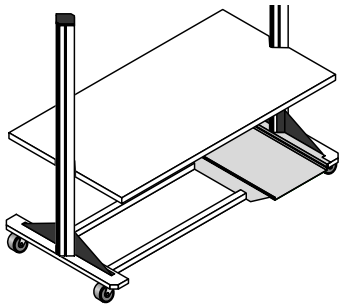
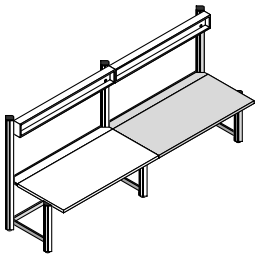
Support plate for compressor

Accessories for mobile workstations

Order no. 158 324

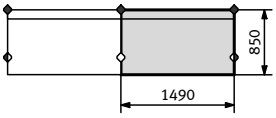


Suitable for up to 2 JUN-AIR (Order no. 091 030). Technical data and descriptions: chapter Training packages – Accessories.

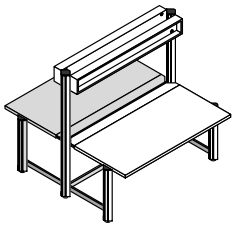


Extension elements for stationary workstations

Order no. 196 943

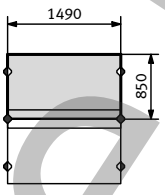


Mounting frame not included.

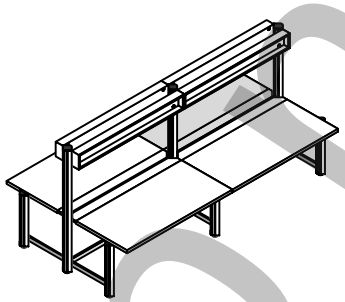


Extension elements for stationary workstations

Order no. 196 944

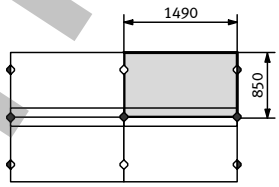


Mounting frame not included.



Extension elements for stationary workstations

Order no. 196 945



Mounting frame not included.

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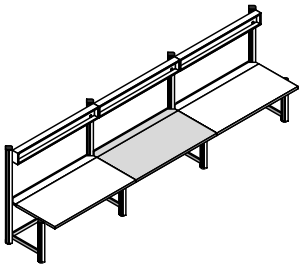
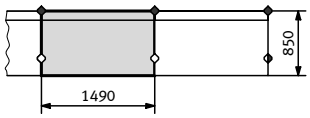
Workstation systems

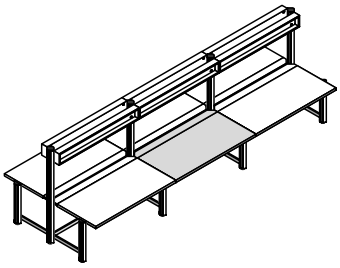
Learnline – Components and accessories



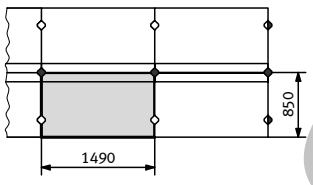
Connecting elements for stationary workstations — Order no. 196 946



Mounting frame not included.



Connecting elements for stationary workstations — Order no. 196 947



Mounting frame not included.

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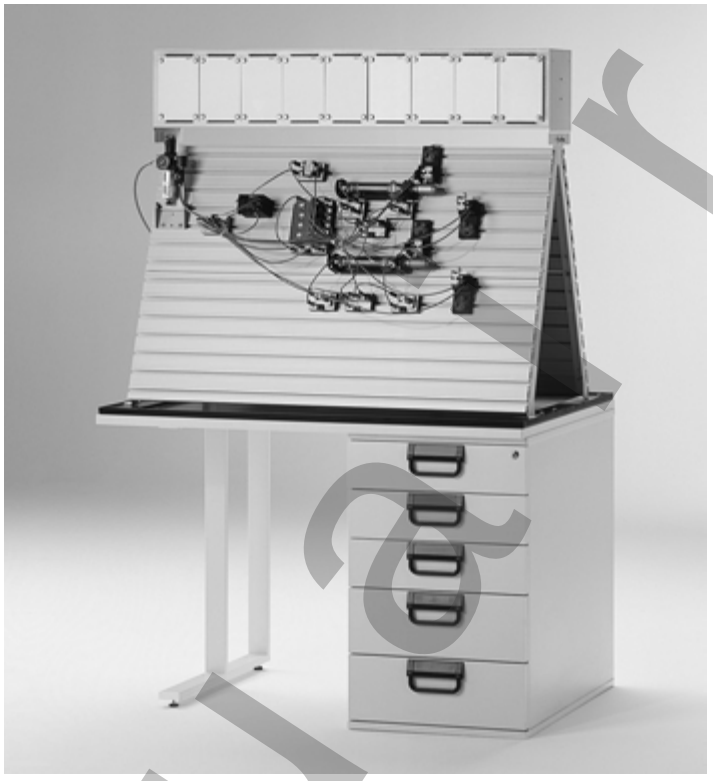
Workstation systems
Economyline

The flexible workstation system for vocational qualification

The low-cost flexible alternative to the Learnline program.

Economyline is produced for all areas of vocational training, research and teaching. A particular distinguishing feature of the workstation system is a clearly arranged, functional storage system which provides users with a clear overview for any qualification needs. That means full functionality at a low cost.



Economyline offers mobile and stationary workstations for one-sided and double-sided use. The extensive range of accessories ensures that the workstations can be adapted perfectly to your requirements.

The system profile plate with grid dimensions of 50 mm is 100 % compatible with the Learnline profile plate.

Thus, all Pneumatic and Hydraulic training packages can be used.

Economyline can be varied using a combination of different fixtures, fittings and supports.

Photo left:
Mobile workplace, access from both sides, with 2 drawer units, vertical profile plate, hydraulic power unit and drip tray.

Photo right:
Mobile workplace, access from one side, with drawer unit and JUN-AIR compressor, and inclined profile plate.

Great importance is placed on the materials used. Economyline is produced with the protection of the environment in mind. The packaging material for the equipment sets, for example, is at the same time used to store the equipment sets when they are not in use.

The drawers:
Easy-gliding, fully-extendable with a safety stop and additional braking system to ensure quiet running and durability.

Non Quarter

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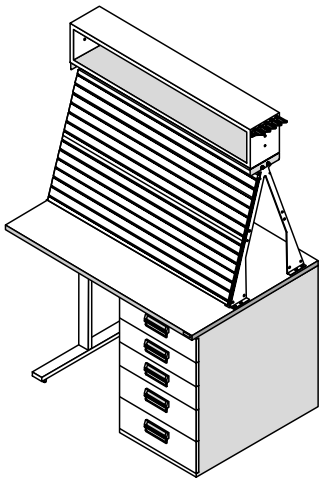
Workstation systems
Economyline – Stationary workstations

Basic equipment

Stationary workstation with powder-coated steel frame and a sturdy 25 mm work surface. Height of work surface: 780mm. Workstation substructure with one or two drawer units (depending on the version), with 4 or 5 steel drawers, Useful depth:. 700 mm, useful width: 375 mm, load up to 20 kg per drawer. Easy-gliding drawer system with differential rollers for quiet running and additional braking system, lockable, front lock, drawer fronts can be labelled.

Stationary workstation with inclined profile plate mount for one-sided use

Order no. 162 356



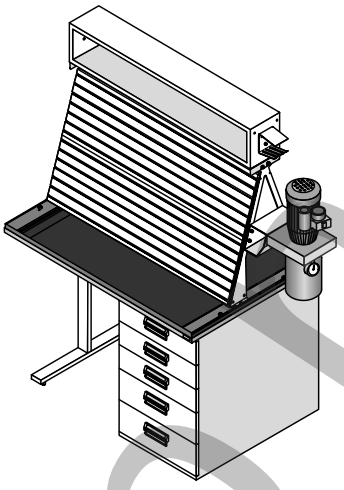
Width _____ 1160 mm
Depth _____ 786 mm
Height including ER mounting frame _____ 1720 mm
Drawers quantity _____ 5
Useful height of drawers _____ 122/166 mm

Accessories shown:

ER mounting frame, components can be mounted on either side	1 unit	Order no. 162 226
Cable guide	1 unit	Order no. 170 469

Stationary workstation with inclined profile plate mount for one-sided use

Order no. 162 357



Width _____ 1160 mm
Depth _____ 786 mm
Height including ER mounting frame _____ 1720 mm
Drawers quantity _____ 5
Useful height of drawers _____ 122/166 mm
With drip tray.

Accessories shown:

ER mounting frame, components can be mounted on either side	1 unit	Order no. 162 226
Hydraulic power unit	1 unit	Order no. 152 962
Mounting kit for hydraulic power unit	1 unit	Order no. 162 225
Holder for storage of hydraulic hoses	1 unit	Order no. 159 412

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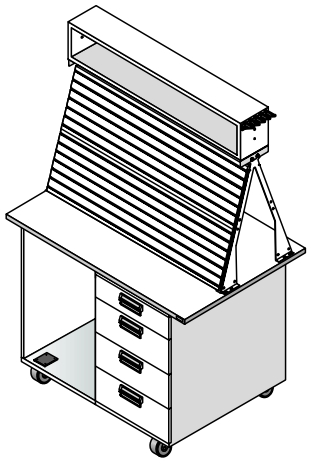
Workstation systems
Economyline – Mobile workstations

Basic equipment

Mobile workstation with powder-coated steel frame and a sturdy 25 mm work surface. Height of work surface: 780mm
All wheels freely movable, two wheels with lockable brake. Workstation substructure with one or two drawer units (depending on the version), with 4 or 5 steel drawers, Useful depth: useful width: 375 mm, load up to 20 kg per drawer. Easy-gliding drawer system with differential rollers for quiet running and additional braking system, lockable, front lock, drawer fronts can be labelled.

Mobile workstation with inclined profile plate mount for one-sided use

Order no. 162 358



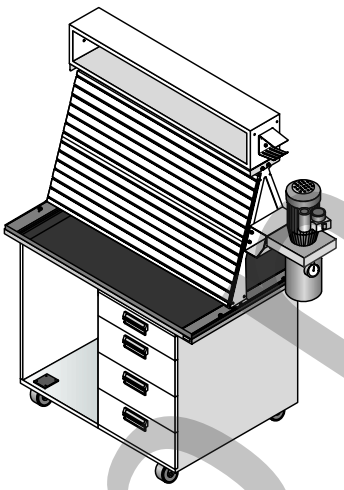
Width _____ 1160 mm
Depth _____ 786 mm
Height including ER mounting frame _____ 1720 mm
Drawers quantity _____ 4
Useful height of drawers _____ 120/166 mm

Accessories shown:

ER mounting frame, components can be mounted on either side	1 unit	Order no. 162 226
Cable guide	1 unit	Order no. 170 469

Mobile workstation with inclined profile plate mount for one-sided use

Order no. 162 359



Width _____ 1160 mm
Depth _____ 786 mm
Height including ER mounting frame _____ 1720 mm
Drawers quantity _____ 4
Useful height of drawers _____ 120/166 mm
With drip tray.

Accessories shown:

ER mounting frame, components can be mounted on either side	1 unit	Order no. 162 226
Hydraulic power unit	1 unit	Order no. 152 962
Mounting kit for hydraulic power unit	1 unit	Order no. 162 225
Holder for storage of hydraulic hoses	1 unit	Order no. 159 412

Additional accessories:

Mounting kit for hydraulic cylinder with weight	Order no. 526 847

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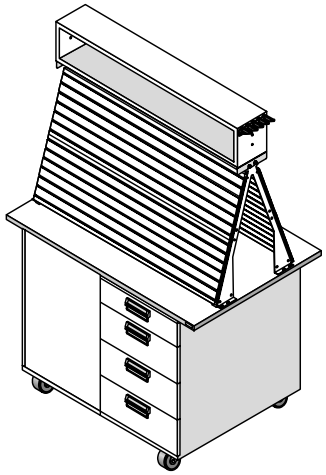
Workstation systems
Economyline – Mobile workstations

Mobile workstation with inclined profile plate mount for two-sided use

Order no. 162 220



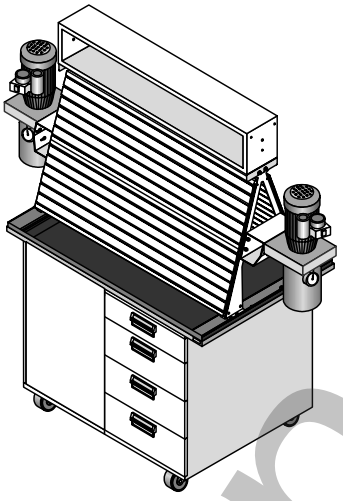
Width _____ 1160 mm
Depth _____ 786 mm
Height including ER mounting frame _____ 1720 mm
Drawers quantity _____ 2 x 4
Useful height of drawers _____ 120/166 mm

Accessories shown:

ER mounting frame, components can be mounted on either side	1 unit	Order no. 162 226
Cable guide	1 unit	Order no. 170 469

Mobile workstation with inclined profile plate for two-sided use.

Order no. 162 221



Width _____ 1160 mm
Depth _____ 786 mm
Height including ER mounting frame _____ 1720 mm
Drawers quantity _____ 2 x 4
Useful height of drawers _____ 120/166 mm
With drip tray.

Accessories shown:

ER mounting frame, components can be mounted on either side	1 unit	Order no. 162 226
Hydraulic power unit	2 unit	Order no. 152 962
Mounting kit for hydraulic power unit	2 unit	Order no. 162 225

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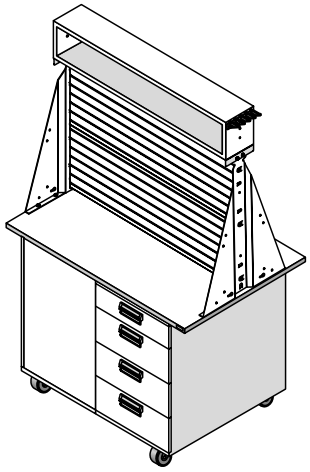
Mobile workstation with vertical profile plate mount for two-sided use

Order no. 162 223



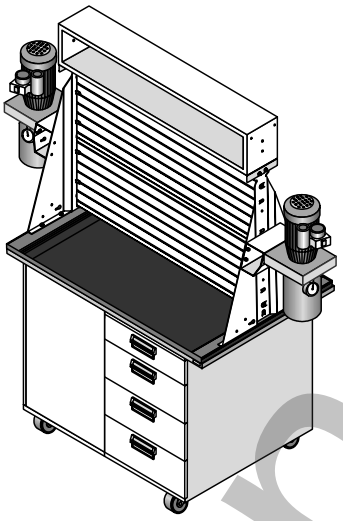
Width _____ 1160 mm
Depth _____ 786 mm
Height including ER mounting frame _____ 1750 mm
Drawers quantity _____ 2 x 4
Useful height of drawers _____ 120/166 mm

Accessories shown:

ER mounting frame, components can be mounted on either side	1 unit	Order no. 162 226
Cable guide	1 unit	Order no. 170 469

Mobile workstation with vertical profile plate mount for two-sided use

Order no. 162 222



Width _____ 1160 mm
Depth _____ 786 mm
Height including ER mounting frame _____ 1750 mm
Drawers quantity _____ 2 x 4
Useful height of drawers _____ 120/166 mm
With drip tray.

Accessories shown:

ER mounting frame, components can be mounted on either side	1 unit	Order no. 162 226
Hydraulic power unit	2 unit	Order no. 152 962
Mounting kit for hydraulic power unit	2 unit	Order no. 162 225

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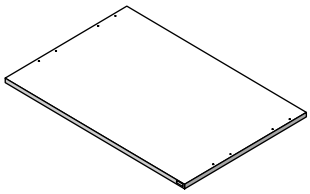
Workstation systems
Economyline – Accessories

Tabletop for stationary workstation

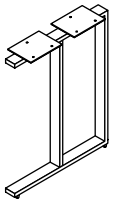
Order no. 120 835



Tabletop 1160 x 786 mm, 25 mm thick. Including mounting parts.

Table leg for stationary workstation

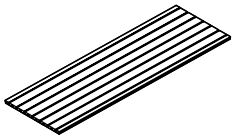
Order no. 120 837



Including mounting parts.

Aluminium profile plate

Order no. 162 360



Dimensions _____350 x 1100 mm

Extension set for horizontal profile plate

Order no. 162 224

Without profile plate.

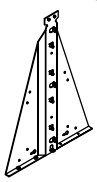
Profile plate frame for inclined profile plate mount

Order no. 357 258

2 per workplace required. Including mounting parts.

Side unit left for vertical profile plate assembly

Order no. 357 282



Including mounting parts.

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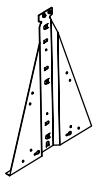
Side unit right for vertical profile plate assembly

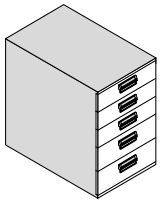
Order no. 357 281



Including mounting parts.

Drawer unit for stationary workstation

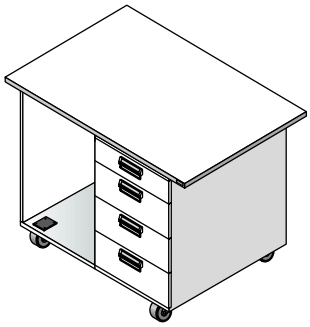
Order no. 162 384



Drawers quantity _____5
Useful height of drawers _____3 x 122 and 2 x 166 mm

Workstation substructure, one side, for mobile workstation

Order no. 162 409



Drawers quantity _____4
Useful height of drawers _____1 x 120 and 3 x 166 mm
Including wheels and mounting parts.

Workstation substructure, both sides, for mobile workstation

Order no. 162 410

Drawers quantity _____2 x 4
Useful height of drawers _____2 x 120 and 6 x 166 mm
Including wheels and mounting parts.

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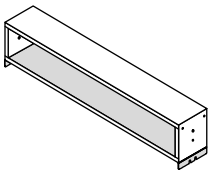
Workstation systems
Economyline – Accessories

ER mounting frame

Order no. 162 226



Including mounting parts.

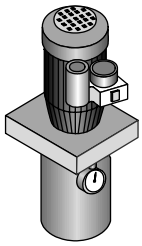
Cable guide

Order no. 170 469

For storage of laboratory cables.

Hydraulic power unit

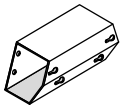
Order no. 152 962
Order no. 159 328



Technical data and descriptions: chapter Training packages – Accessories.

Mounting kit for hydraulic power unit

Order no. 162 225



Allows mounting of hydraulic power units (Order no. 152 962, 159 328) to profile plate holder or side parts.

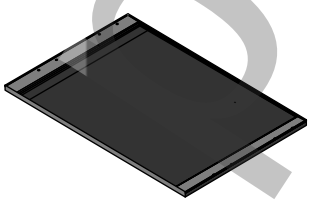
Holder for storage of hydraulic hoses

Order no. 159 412

At a workstation with a hydraulic power unit, the holder for hydraulic hoses can be mounted on the opposite side on the ER mounting frame. If the workstation has two hydraulic power units, the hose holders cannot be mounted on the work-station. In this case, the hose holder can be mounted on a wall.

Drip tray

Order no. 357 283



Including mounting parts

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Documents Provided by Coast Pneumatics
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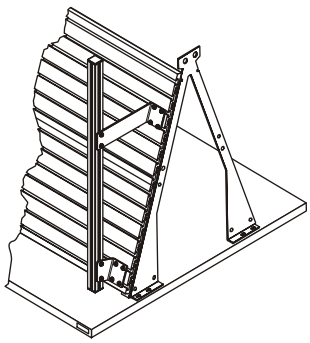
Mounting kit for hydraulic cylinder with weight

Order no. 526 847



Including mounting parts.

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Workstation systems
Virtual World of learning

Design your own training laboratory in 3D.

The software for this is available free on the Demo CD "Interactive Guide to Festo Didactic" or in the Internet at www.festo.com/didactic.

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Documents Provided by Coast Pneumatics

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Software and Courseware

Learning programs (CBT and WBT)

Design and simulation software

Programming and visualization software

Books
Transparency sets
Videos
Posters
Additional accessories

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Software and Courseware
Overview

Edutainment® from Festo Didactic: multimedia learning and fun

As the Third Millennium begins, our product-oriented society has changed to an information-oriented community. Being informed is the formula to success.

Knowledge should be comprehensible, compact and always accessible.

Software, courseware and other media: here you will find our huge range of materials for automation and general technology.

Take a look for yourself – and test our training offerings in the Internet at: www.festo.com/didactic

New: Web-based training. Vocational and continuing training via the Internet. Site licenses for companies, schools and institutions.

Courseware

Theory and practice. We have a wide range of Courseware tailored to your needs:

- **Text books**
  Standard books imparting basic knowledge. With many exercises and practical examples – these can be solved without the hardware. Ideal for self-study and as a guide to trainers.
- **Workbooks**
  Practical exercises with supplementary notes, worked examples and data sheets. The exercises are based on the various Festo Didactic equipment sets. For comprehensive, practice-focused training.
- **Dictionaries, manuals, and technical books**
  offer specialized information for coverage of various topics in greater depth. Ideal for reference or self-study.

Other media

All training media are suitable both for use in the classroom and for self-study:

- **Transparency sets, videos**
  didactically designed for easy-to-follow and interesting presentation.
- **Posters**
  The large A1 formats are a clear and striking medium for the presentation of complex subject matter.
- **Working material**
  Media for optimum training, reducing preparation time and cutting classroom time.

preview

Documents Provided by Coast Pneumatics

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Software and Courseware
Overview

Software

Software is taking on an increasingly important role in modern qualification concepts:

Self-study programs, simulation software and virtual learning environments are now typical features of many training segments in schools, company and vocational training organizations.

Being able to rapidly implement learning successes in day-to-day industrial practice is an important aspect during the development phase of all our products. Practical exercises and industrial production or assembly processes are therefore always of first importance.

Web-based training:
Learn online with Festo Didactic. Various software programs are now available as WBT for intranets and the Internet, such as Fluid Studio®.
Try out our online training at www.festo.com/didactic.

Our special service:
Test and order our software products at the click of a mouse:
www.festo.com/didactic
Or request our free demo CD-ROM "Interactive Guide to Festo Didactic".

Award-winning quality:

FluidSIM® Pneumatics
German educational software award 1996
FluidSIM® Hydraulics
Bronze Worlddidac Award 1996
The Fascination of Technology
German educational software award 2000 and Worlddidac Award 2000
COSIMIR® Educational
Nominated for the German educational software award 2001

	Learning programs	Design and simulation	Programming and visualization
The Fascination of Technology	The Festo Dictionary of Automation From the hand wedge to the robot (CBT)		
Pneumatics	Fluid Studio® Pneumatics (CBT) Fluid Studio® Pneumatics (WBT)	FluidSIM®3 Pneumatics	
Servopneumatics			WinPISA for SPC 200
Hydraulics	Fluid Studio® Hydraulics (CBT) Fluid Studio® Hydraulics (WBT)	FluidSIM®3 Hydraulics	Fluid Lab®-H
Robot technology	COSIMIR® Educational	COSIMIR® Professional COSIMIR® Industrial COSIROP	COSIMIR® Professional COSIMIR® Industrial COSIROP
Electronics/PLC	Bus Studio (WBT)	COSIVIS process simulation software	MULTIPROG wt FST Siemens STEP 7 Siemens STEP 5
Process visualization			InTouch WinCC

Documents Provided by Coast Pneumatics

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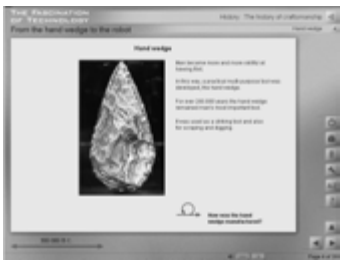
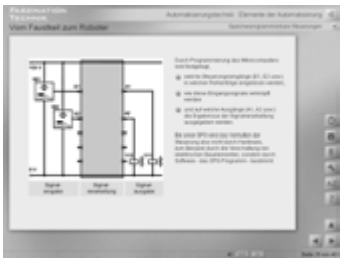
Software
Learning programs

The fascination of technology:
From the hand wedge to the robot





System requirements:
– PC with Win 95/98/2000/ME/NT
– At least Pentium 100 MHz
– 32 MB RAM
– Approx. 75 MB space on hard disk
– Soundblaster compatible soundcard
– 12x CD-ROM drive

The fascination of technology

An interactive journey through time and through the fascinating world of technology. The new learning software from Festo Didactic's Edutainment® series.

In the beginning was the wedge!
From simple hunting tools to the automatic telling machine. This exciting journey through time shows how inventions changed the world. New patterns of behavior, living and working resulted. From hunter to shopper.

See for yourself:
– How industrialization started with the steam engine.
– How the conveyor belt revolutionized factories.
– How modern automation technology influences our daily lives.
– What technology will bring us in the future.

The fascination of technology also lets you put your newly-acquired knowledge into practice right away. You can solve practical and theoretical tasks in a virtual laboratory. The fascination of technology supports you as you find your solution – and carries out corrections interactively.

It makes learning a complete experience. Edutainment® is fun:
– 350 illustrations
– 200 animations
– 48 sound documents
– 300 spoken commentaries
– Virtual rooms
– Bookmarks
– Structured learning units

Single license
Order no. 194 034 (German)
ISBN 3-8127-4034-6
Order no. 194 035 (English)
ISBN 3-8127-4035-4
Order no. 194 036 (Spanish)
ISBN 3-8127-4036-2
Order no. 194 037 (French)
ISBN 3-8127-4037-0
Order no. 525 724 (Dutch)

The Festo Dictionary of Automation

System requirements:
– PC with Win 95/98/2000/NT
– At least Pentium II 133 MHz
– 32 MB RAM
– Approx. 26 MB free hard disk

The fascinating of technology

The latest edition of the dictionary on CD-ROM contains some 18,000 terms in German, English, Spanish, French and Italian from the areas of automation technology (basics and products), organization and administration.

This is an indispensable aid to mechatronics specialist training.

Order no. 525 722
(German, English, Spanish, French, Italian)

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Documents Provided by Coast Pneumatics
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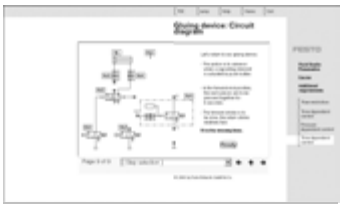
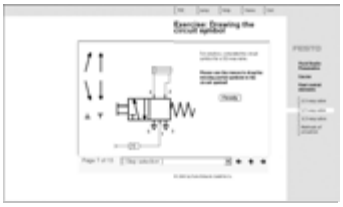
Fluid Studio® as CBT and WBT

Pneumatics, Hydraulics



Circuit diagram



Circuit symbols

Multiple choice questions

These interactive self-study programs are designed to teach the fundamentals of pneumatic or hydraulic circuits. You can complete the most important exercises of a pneumatic or hydraulic basic course, such as as part of a basic vocational training course, both practically and theoretically in 2 days. Various forms of exercises make the course interesting and successful: you must draw circuit diagrams and symbols, answer multiple choice questions, draw circuit diagrams according to DIN ISO 1219 and construct and connect circuits in video clips on a PC.

New:
Fluid Studio® now also as Web-Based Training (WBT). For use in intranets or E-Learning platforms. For detailed information, please visit: www.festo.com/didactic.

Main subjects of course: The fundamentals of pneumatics:
– Drive components
– Power supply
– Actuators
– Signalling elements
– Control units
– Supplementary requirements

Main subjects of course: The fundamentals of hydraulics:
– Principles of a hydraulic system
– Power supply unit
– Drive units
– Directional control valves
– Non-return valves
– Pressure control valves
– Pressure control valves

System requirements:
– PC with Win 95/98/2000/ME/NT
– At least 80486, 66 MHz
– 8 MB RAM
– Approx. 15 MB space on hard disk (CBT)
– Soundblaster compatible soundcard
– 4-speed CD-ROM drive
– Internet Explorer 5.0 or Netscape 4.7 or later (WBT)
– Media player (WBT)

Fluid Studio®	German	English
Pneumatics		
Single license	184 525	184 528
n-user license for local licensing	529 387	529 389
n-user license for network licensing	529 388	529 390
WBT (Web-Based Training): Individual licenses for corporate licensing	On request	On request
Hydraulics		
Single license	167 114	167 117
n-user license for local licensing	529 391	529 393
n-user license for network licensing	529 392	529 394
WBT (Web-Based Training): Individual licenses for corporate licensing	On request	On request

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Documents Provided by Coast Pneumatics

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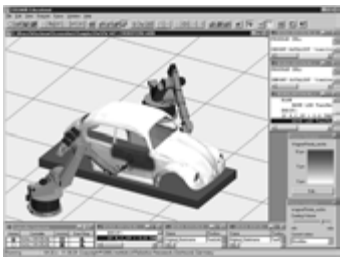
Software
Learning programs

COSIMIR® Educational

Robot technology



System requirements:
– PC with Win 95/98/2000/NT
– At least Pentium II 200 MHz
– 64 MB RAM
– Free hard disk space:
  Educational: 650 MB
  Professional: 300 MB
  Industrial: 300 MB
– Graphics card with Open-GL support, 4 MB RAM, 1024 x 768
– 16-speed CD-ROM drive

Nominiert für digita 2001

COSIMIR® – the new generation of PC-based software packages for 3D modeling, programming and simulation of production cells with industrial robot systems.

COSIMIR® Educational:
Interactive learning program for robot technology and professional 3D software program or programming and simulation of robots using numerous predesigned robot cells.

COSIMIR® Professional:
Modeling, simulation and programming of various industrial robots. The interactive learning program from COSIMIR® Educational is also included.

COSIMIR® Industrial:
Professional software for offline programming of Mitsubishi robot systems.

Test COSIMIR® extensively for 30 days using the new test version. Order now!

The main features of COSIMIR® Educational:
– An extensive library of predefined work cells, which comprises the entire spectrum of industrially compatible application definitions: From simple handling tasks right through to a complete robot production line.
– Information about industrial positioning of any problem, training target allocation, necessary prior knowledge and solution tips.
– Programming in the Mitsubishi programming language Melfa Basic IV and the standard robot programming language IRL. This facilitates learning in parallel of a structured high level programming language in virtual application scenarios.
– Creating own web compatible animations using a convenient instruction tool.
– Complete function range of COSIMIR® Professional; however, without the facility of creating any new work cells. Download to real robot controllers is possible only with COSIMIR® Professional or COSIMIR® Industrial.

For a detailed description of all functions and contents: wwwfesto.com/didactic.

COSIMIR® Educational	German	English
Single license	194 030	194 031
Multiple license for 6 workstations	194 023	194 025
Multiple license for 12 workstations	194 032	194 033
Network license for x workstations	526 259	526 260
Trial version (free)	196 532	196 532

Other languages: Spanish, French, Korean, Japanese on request.

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Documents Provided by Coast Pneumatics

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Bus Studio WBT
Fundamentals of fieldbus technology

System requirements:
– PC with Win 95/98/2000/ME/XP/NT
– Internet Explorer 5.0 or Netscape 4.7 or later
– Macromedia Flash Player 5.0 (supplied on CD-ROM)
– 8-speed CD-ROM drive

Fieldbus technology

This multimedia interactive web-based training program teaches basic fieldbus technology. It is suitable for beginners wishing to gain an overview of fieldbus technology. Animations illustrate the various practical examples. All relevant terms are defined in the integrated glossary.

Depending on previous knowledge, the program takes about one hour to complete.

Content:
– Mode of operation and benefits of fieldbus systems
– Application areas of various fieldbus systems
– Open and closed systems
– Technical concepts
– Data transmission standards RS 485 and RS 422
– Fieldbus system topologies

Order no on request (German)
Order no on request (English)

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Documents Provided by Coast Pneumatics
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Software
Designing and simulating

FluidSIM®3.5

Pneumatics, hydraulics

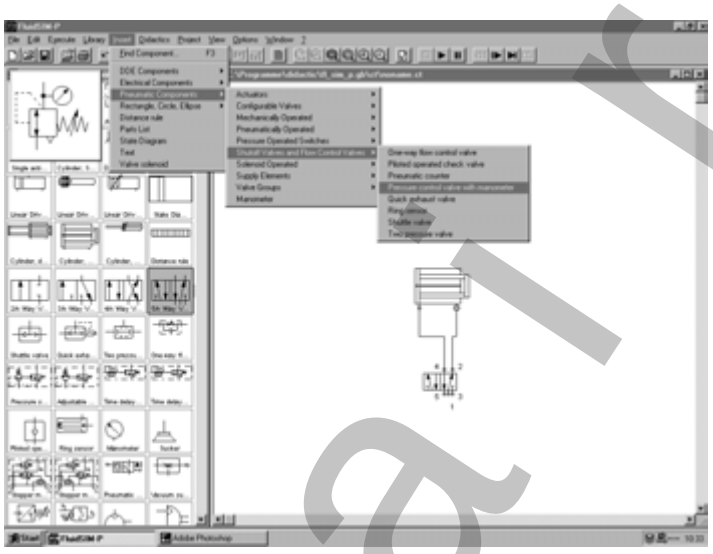
FluidSIM® is versatile for preparing instruction in schools and vocational training, as an experimentation and self-learning system, or as a CAD system for the design of control systems.

We have totally re-engineered and substantially expanded this best-selling design and simulation program.

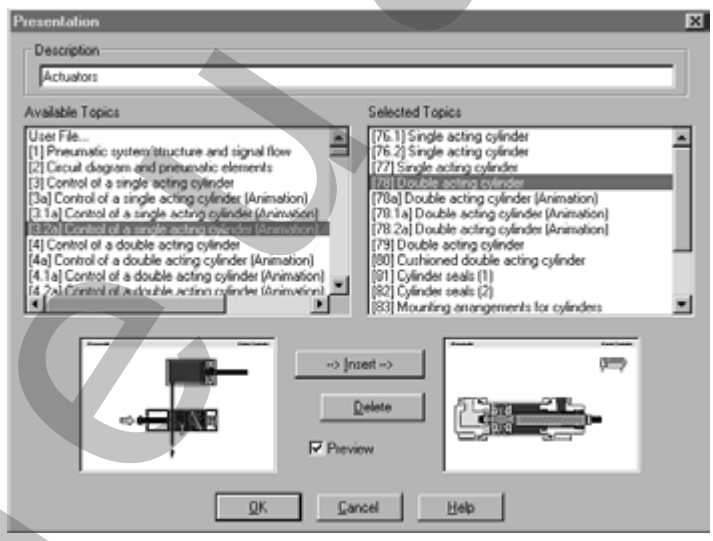
Try out the demo version in the Internet and see for yourself.

New functions and content:
- Integrated film sequences now in DVD quality
- Expanded, configurable libraries with well over 100 symbols
- Symbols compliant with DIN/ISO 1219
- New CAD functions: Align, group, drawing levels
- Valve editor
- Improved print function with greater range of settings
- Support of additional units: lbf, psi, gal
- Large range of values for power and force in the hydraulic version: up to 350 bar/20000 N
- Automatic parts list generation
- Port identification
- Diagrams and measured value logs for the most important status variables
- DXF import
- DDE server interface
- Revised teaching materials
- Project administration
- Optimized for Windows 98/ME/2000/XP

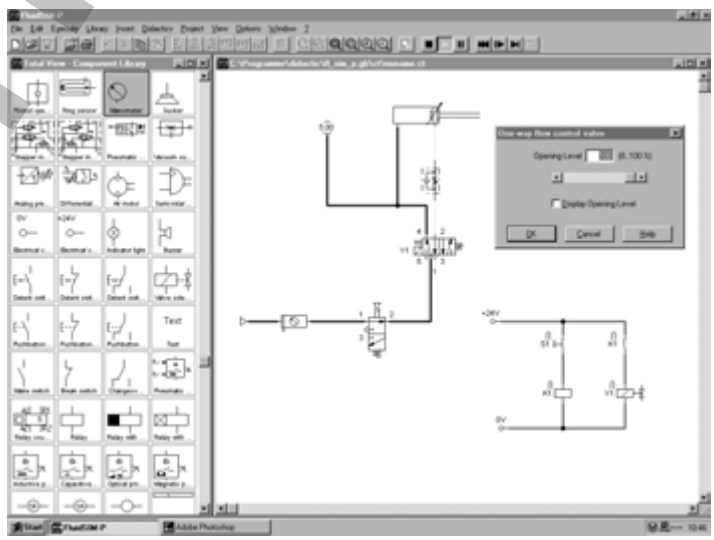
We fulfill your wishes:
- Select the type of license that best suits your needs
- Update for all FluidSIM® versions, also with free license selection



Professional drawing:
FluidSIM® lets you create standard-compliant drawings with an ease and confidence that other simulation and drawing programs have not previously achieved.



Effective instruction:
Extra features are now standard! FluidSIM® offers integrated presentation software with complete slide sets and animated cutaway drawings on various topics. Of course it is also no problem to create your own presentations – integrating graphics, text or video from other Windows programs.



Accurate simulation:
The circuit diagram on the left shows a simple pneumatic system controlled by an electrical circuit. You can set operating pressure, cylinder size and flow-control valve setting.

FluidSIM® simulates the behavior of the system accurately. That is why this program is the ideal "Experimenter" for an economical and practical introduction to control engineering.

XPS-95
1. Prize
Expert Systems Exhibition

Bronze Award 1996

Documents Provided by Coast Pneumatics

preliminary

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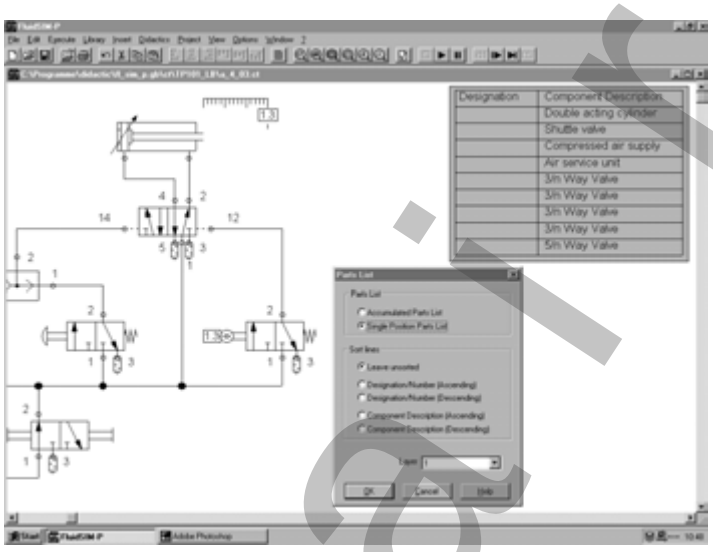
Software
Designing and simulating

Training aims:

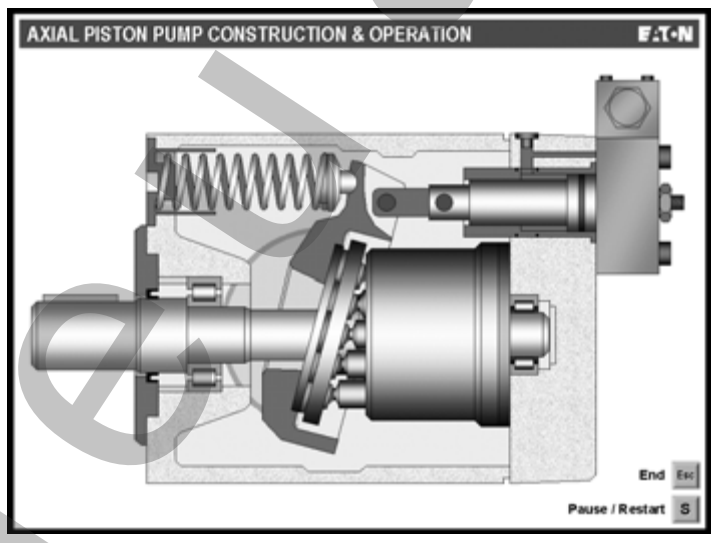
Planning controllers:
– Project administration
– Create your own libraries
– Draw circuits
– Use more than 100 prepared symbols
– Use prepared stored identifiers
– Grid and snap function for connections
– Automatic standard-compliant positioning of components
– Use layers
– Create drawing frames
– Print in all drawing formats with print preview
– Automatic preparation of parts lists



Creating tasks and solutions for instruction:
– Exercise sheets for connection and supplementing of elements
– ISO-compliant labeling
– Publication of solutions as printout or tested file

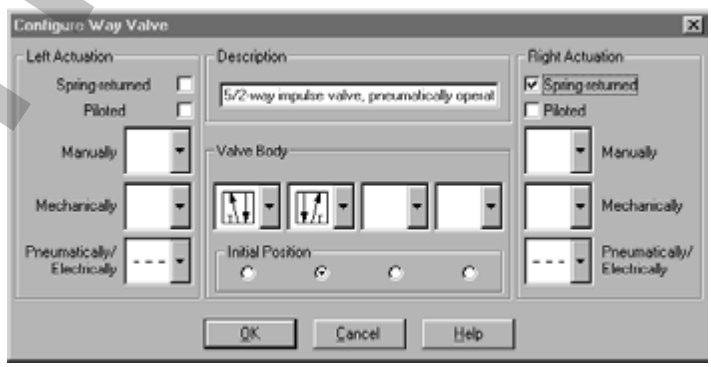
Conducting experiments during lessons:
– Timing dependent on flow control valve setting and operating pressure
– Displacement-time diagrams
– Time delay

Explain basic pneumatic and hydraulic circuits:
– Based on textbooks "Pneumatics, Basic Level" and "Hydraulic, Basic Level"
– Based on BIBB and workbook TP 100/200/500/600
– With prepared slides in the hydraulics version, now with many new instruction foils by our hydraulics partner Eaton Corporation
– With own sets of slides
– Complemented by files such as graphics, AVI files, WAV files and text



Explain basic electrical circuits:
– For example parallel and/or series circuits with pushbutton or switch, and indicator lamp/acoustic alarm
– Structure of relay circuits

Document projects and instruction:
– Use FluidSIM® slides and photos
– Use individual symbols and complete circuits from FluidSIM®
– Document findings displacement/time diagram



Connect real hardware to FluidSIM®:
– Use FluidSIM® as a virtual controller: Control real hardware – such as the TP 101
– FluidSIM® as a virtual process: Control FluidSIM® circuits with an external PLC

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Documents Provided by Coast Pneumatics

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Software
Designing and simulating

FluidSIM®	German	English	Spanish	French
FluidSIM®3.5 Pneumatics				
Student version**	193 754	193 758	532 670	532 671
Single-user license	193 756	193 760	532 672	532 673
n-user license for local licensing****	529 383	529 385	532 674	532 675
n-user license for network licensing****	529 384	529 386	532 676	532 677
Update (local or network)***	*	*	*	*
FluidSIM®3.5 Hydraulics				
Student version**	197 082	197 088	532 678	532 679
Single-user license	197 084	197 090	532 680	532 681
n-user license for local licensing****	529 379	529 381	532 682	532 683
n-user license for network licensing****	529 380	529 382	532 684	532 685
Update (local or network)***	*	*	*	*

Other languages: Italian, Russian, Turkish, Chinese and Korean on request.

* On request.

** Installation without dongle possible. The range of functions then corresponds to Version 2 with the following limitations: no didactic materials, no pressure function, no support for the clipboard, status variables cannot be changed, no display of simulation results, simulation of max. 2 cylinders.

*** When ordering your update, please provide the license number of your version. You will find this in the “Help“ menu under Product information. You will receive an Update CD-ROM with a a key code specific to your license number. This code must be entered during installation. This key code allows you to update all licensed multi-user licenses. For updating of the networked version, please contact Festo Didactic.

**** When ordering the multi-user license, please indicate the required number of licenses. Your software licensing of your software package varies dependent on the version ordered:

1. For the network variant, the license is assigned via a license server in the network.
2. For local installation, a license is permanently assigned to each computer.

System requirements:
- PC with Win 95/98/2000/ME/XP/NT
- At least Pentium II 133 MHz
- 64 MB RAM
- Sound card
- 4-speed CD-ROM drive

Scope of delivery:
- Design and simulation software
- Extensive symbol libraries
- Collection of basic circuits
- Video sequences in DVD quality
- Comprehensive manual (for full versions)
- DDE driver for EasyPort
- Dongle

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Documents Provided by Coast Pneumatics
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COSIMIR® Professional

System requirements:
– PC with Win 95/98/2000/NT
– At least Pentium II 200 MHz
– 64 MB RAM
– Free hard disk space:
  Educational: 650 MB
  Professional: 300 MB
  Industrial: 300 MB
– Graphics card with Open-GL support, 4 MB RAM, 1024 x 728
– 16-speed CD-ROM drive

Nominiert für 2001 digita

Robot technology

COSIMIR® – the new generation of PC-based software packages for 3D modeling, programming and simulation of production cells with industrial robot systems.

COSIMIR® Professional is the industrially tried and tested, extremely high-performance 3D robot simulation system for Windows 95/98/2000 and NT. It now combines three tools through one common interface:
– 3D simulation
– 3D modelling
– Robot programming

The graphic view uses the OpenGL standard and ranges from the very simple wireframe representation to a shaded view allowing for several light sources and with removal of all hidden surfaces.

Modelling of robot cells using the mouse
You can plan and model any type of robot cell simply and conveniently. Numerous functions and libraries are available for the design and editing of work cells:
– Library with extensive selection of robot systems
– Library with grippers and welding guns
– Library with numerous automation components, such as sensors, magazines, conveyor belts, CNC machines, etc
– Importing of different CAD formats such as DXF, STL or VDAFS2.0

Testing and working with the robot in simulation mode
All motion sequences and handling processes can be instantly simulated in the modelled work cell to avoid collisions and optimize cycle times:
– Real-time 3D representation of all motion sequences with collision detection in various different freely configurable windows
– Views can be interactively moved, turned or zoomed using the mouse
– Teaching of robot movements with the mouse
– Interactive setting of inputs and outputs to simulate the interaction of the robot with its environment
– Simulation of multi robot systems
– Sensor and process simulation
– PLC functionality
– DDE interface for communication with other PC applications or external control systems
– Optional expansion of VR functionality, i.e. additional modules for the realisation of complete virtual reality (VR)

Robot programming
COSIMIR® Professional support programming in IRL (DIN 66312) of the Kuka Programming Language KRL, the ABB programming language Rapid, V+ for Adept and Stäubli robots, the Mitsubishi programming languages Movemaster Command and Melfa Basic III and IV:
– High-performance programming assistant with syntax check and automatic integration of position lists
– Automatic creation of complex robot motion paths via parameter assignment
– Upload and download to and from Kuka, ABB, and all Mitsubishi controllers

Single license*
Order no. 194 026 (German)
Order no. 194 027 (English)

Trial version (free)**
Order no. 196 532 (German, English)

* This full version includes the integrated learning software COSIMIR® Educational. It can be used independently as an extremely cost-effective learning environment both for instructors and students. (See Software – Learning programs).

** Test COSIMIR® extensively for 30 days using the new test version. Order now!

preliminary

Documents Provided by Coast Pneumatics
ORDER ONLINE

ORDER ONLINE

Software
Designing and simulating

COSIMIR® Industrial

System requirements:
– PC with Win 95/98/2000/NT
– At least Pentium II 200 MHz
– 64 MB RAM
– Free hard disk space:
  Educational: 650 MB
  Professional: 300 MB
  Industrial: 300 MB
– Graphics card with Open-GL support, 4 MB RAM, 1024 x 768
– 16-speed CD-ROM drive

Robot technology

COSIMIR® – the new generation of PC-based software packages for 3D modeling, programming and simulation of production cells with industrial robot systems.

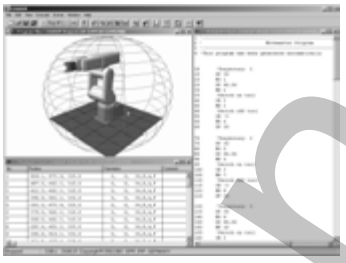
COSIMIR® Industrial is t the low cost professional software for off-line programming of Mitsubishi robot systems with the essential functionality of COSIMIR® Professional:
– 3D simulation
– 3D modelling
– Robot programming

COSIMIR® Industrial differs from COSIMIR® Professional with regard to the following characteristics:
– Model library contains Mitsubishi robot systems only
– No sensor and process simulation
– No automatic creation of robot motion paths
– No simulation of multi-robot systems
– No PLC functionality
– Up- and download only possible for Mitsubishi robot systems
– Expansion towards virtual reality is not possible

Single license
Order no. 194 022 (German, English)

Multiple license for 6 workstations
Order no. 194 028 (German, English)

COSIROP



System requirements:
– PC with Win 95/98/2000/NT
– At least Pentium I 133 MHz
– 64 MB RAM
– Approx. 40 MB space on hard disk
– 8-speed CD-ROM drive

Robot technology

Powerful software for programming of Mitsubishi robot systems with the following functionality:
– Project wizard for selection of robot configuration and extensive documentation of projects
– Programming in MRL and Melfa Basic III and IV with extensive online help
– Command list tool with online communication to robot controller
– Syntax test
– Online I/O monitor
– Up- and download of position lists and programs
– Parameterization of robot system data

COSIROP is a Mitsubishi product, but is part of the core of COSIMIR® Industrial und Professional.

Single license
Order no. 197 526 (German, English)

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COSIVIS

System requirements:
– PC with Win 95/98/2000/NT
– At least Pentium II 266 MHz
– 32 MB RAM
– Approx. 20 MB space on hard disk
– Sound card
– 8-speed CD-ROM drive

Process simulation

Contains 3D process models for the exercises from TP 301 (15 models) and the MPS® modules and stations (10 models). These models behave as real process models when appropriately controlled. With a password-protected error setting panel for the instructor, error compensation panel for the seminar participants and error analysis logging. Comprehensive documentation of all models in the software and in the manual.

Supplied with dongle.

Types of control:
– Real PLC via EasyPort interface
– SIMATIC PLCSIM
Drivers for the many connection possibilities can be downloaded free of charge from www.festo.com/didactic.

Single license
Order no. 184 523 (German)
Order no. 184 524 (English)
Order no. 167 193 (French)

Multiple license for 6 workstations
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Order no. 167 160 (English)
Order no. 167 209 (French)

Multiple license for 12 workstations
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Order no. 167 161 (English)
Order no. 167 210 (French)

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Software
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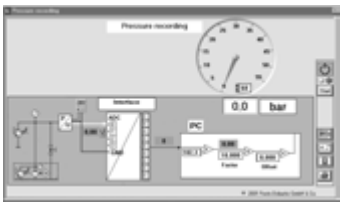
Fluid Lab®-H



System requirements:
– PC with Win 95/98/2000/NT
– At least Pentium II 200 MHz
– 32 MB RAM
– 8-speed CD-ROM drive

Hydraulics

Single license
Order no. 525 276 (German, English)

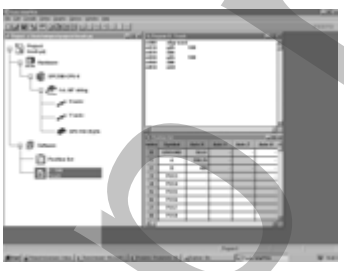
Fluid Lab®-H is the new cost-effective measuring software allowing quick and easy measurement, representation and documentation of hydraulic systems. The measurements use existing pressure and flowrate sensors, normally with 1 – 10 V output voltage – connected to the new EasyPort DA. This new EasyPort DA translates the signals for the PC – and your are already started on various exercises.

Fluid Lab-H allows trainees to carry out all experiments relevant to basic training. This are:
– Measuring pressure
– Measuring volumetric flow
– Volume characteristic
– Line test
– Flow-control and regulating valves
– Pressure-relief valve
– Directional control valve opening
– Basic circuit and circulation
– Primary control
– Secondary control
– Counterbalancing
– Quick feed

The experiment setups are described in detail in the software and results are interpreted. In order to be able to carry out the experiments, the following components are required in addition to your existing hydraulic equipment sets:

1 Easy-Port DA (Interface)	Order no. 193 930
1 PC data cable RS232	Order no. 162 305
1 connection unit, analog	Order no. 162 247
1 I/O data cable, analog	Order no. 189 551
1 universal connection unit, digital (SysLink)	Order no. 162 231
1 I/O cable with SysLink connectors (IEEE 488) on each end	Order no. 034 031
3 pressure sensors	Order no. 525 964
1 flowrate measuring device	Order no. 183 736

WinPISA programming language for SPC 200



System requirements:
– PC with Win 95/98/NT
– At least Pentium
– 4 MB RAM
– Approx. 30 MB space on hard disk
– 8-speed CD-ROM drive

Servopneumatics

Order no. 170 095 (German)
Order no. 170 097 (English)

WinPISA is software for planning, commissioning, programming and service of pneumatic axles with the SPC 200 axle controller. It offers the following functions:
– Convenient management of various positioning drives in projects
– Commissioning and diagnosis of positioning drives in online mode
– Programming of positioning systems in accordance with DIN 66025
– Graphic presentation of measured values

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MULTIPROG wt programming language for FEC FC30/34

System requirements:
– PC with Win 95/98/NT
– 64 MB RAM
– Approx. 60 MB space on hard disk
– 4-speed CD-ROM drive

PLC technology

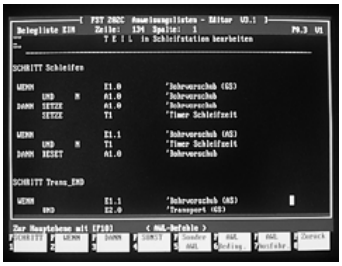
MULTIPROG wt is a standard programming system for programmable logic controllers. It is based on the IEC 1131-3 standard and includes all IEC features. MULTIPROG wt consists of a PLC-independent core for programming in the various IEC programming languages: these include the text-based languages Structured Text (ST) and Instruction List (IL) and the graphic languages Function Block Diagram (FBD), Ladder Diagram (LD) and Sequential Function Chart (SFC).

An editor wizard is available for programming in the various languages. It allows fast and very simple insertion of prepared keywords, instructions, operators, functions and function modules into the individual work sheets. The editor wizard can also be used for the declaration of variables and data types. The current version is designed for programming the FEC-FC30/34 programmable logic controller (See chapter Training packages – Electronics/PLC – Controllers).

Includes manual in PDF format (German, English).

Order no. 189 530
(German, English, French)

FST programming software for IPC/FEC



System requirements:
– PC with Win 95/98/NT
– At least 80286
– 1 MB RAM
– Approx. 2 MB space on hard disk
– 3.5" disk drive

PLC technology

FST IPC/FEC has powerful functions for programming testing, commissioning and service of automation projects. The tried-and-tested programming languages Instruction List (IL) and Ladder Diagram(LD) are available for programming.

Software (3.5 diskettes) and manual.

Order no. 185 471 (German)
Order no. 185 472 (English)

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Software
Programming and visualizing

Programming software Siemens
STEP 7 Basic software

System requirements:
– PC with Win 95/98/2000/NT
– At least Pentium 200 MHz
– 64 MB RAM
– Approx. 125 MB space on hard disk
– 8-speed CD-ROM drive

PLC technology

The basic software STEP 7 is the standard tool for the automation systems SIMATIC S7, SIMATIC M7 and SIMATIC C7. It enables the user to use the working capacity of these systems comfortably and easily.

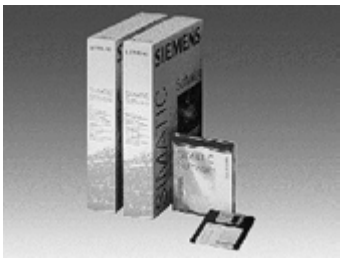
STEP 7 contains user-friendly functions for all phases of an automation project:
– Configuration and parameterization of hardware
– Defining communication
– Programming
– Testing, commissioning and servicing

The reliable programming languages Statement List, Ladder Diagram, Function Chart are available for programming. Programs can be created in the classical PLC programming language Ladder Diagram in accordance with DIN EN 6.1131-3.

Software (CD-ROM), with documentation as PDF files.

Order no. 184 562
(German, English, French, Spanish, Italian)

Programming software Siemens
STEP 7-Mini



System requirements:
– PC with Win 95/98/NT
– At least Pentium 200 MHz
– 32 MB RAM
– Approx. 50 MB space on hard disk
– 8-speed CD-ROM drive

PLC technology

STEP 7-Mini is the most reasonably priced software for implementing simple stand-alone SIMATIC S7-300 and C7-620 applications. Communication between automation systems is not supported. The following programming languages are supported: Statement List, Function Chart and Ladder Diagram.

The SIMATIC Engineering Tools such as S7-GRAPH (SFC) and S7-SCL (ST) cannot be implemented with STEP 7-Mini.

Software (CD-ROM), with documentation as PDF files.

Order no. 184 561
(German, English, French, Spanish, Italian)

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Programming software Siemens STEP 7-SCL

System requirements:
– PC with Win 95/98/2000/NT SIMATIC S7-300 (CPU 314 or better), S7-400, C7-620 executable on programming devices PG 720, PG 720C, PG 740 und PG 760
– At least Pentium 200 MHz
– 64 MB RAM
– Approx. 8 MB space on hard disk
– 8-speed CD-ROM drive

PLC technology

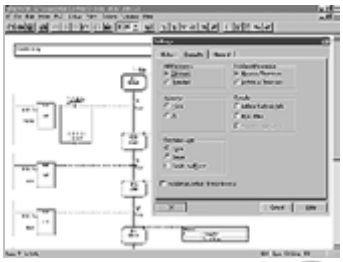
STEP 7-SCL (Standard Control Language) is a high-level language similar to Pascal, optimized for programming programmable logic controllers. STEP 7-SCL is in accordance with the standard IEC 1131-3 (Structured text) and is suitable in particular for programming complex algorithms or for tasks originating from the field of data processing.

The user is therefore able to formulate solutions for automation projects quickly and at a low cost. The software can be used for all automation systems SIMATIC S7-300 (from CPU 314), SIMATIC S7-400 and SIMATIC C7-620. Only executable with STEP 7 basic software.

Software (CD-ROM),with documentation as PDF files.

Order no. on request
(German, English, French, Spanish, Italian)

Programming software Siemens STEP 7-GRAPH



System requirements:
– PC with Win 95/98/2000/NT SIMATIC S7-300 (CPU 314 or better), S7-400, C7-620 executable on programming devices PG 720, PG 720C, PG 740 and PG 760
– At least Pentium 200 MHz
– 32 MB RAM
– Approx. 5 MB space on hard disk
– 8-speed CD-ROM drive

PLC technology

Using the option package STEP 7-GRAPH (Sequential Function Chart) sequences within a process are planned and programmed in a standardized method of representation (in accordance with IEC 1131-3). The sequence (such as the production of a component) is broken down into a series of steps with a clear function which either occur in series or parallel to one another.

Only executable with STEP 7 basic software.

Software (CD-ROM),with documentation as PDF files.

Order no. on request
(German, English, French, Spanish, Italian)

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Software
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Programming software Siemens
Trainer Package STEP 7

System requirements:
– PC with Win 95/98/2000/NT
– At least Pentium 200 MHz
– 64 MB RAM
– Approx. 150 MB space on hard disk
– 3.5“ disk drive or
4-speed CD-ROM drive

PLC technology

It contains the programming languages STL, LAD, FCH (basic package) and STEP 7-SCL, STEP 7-HiGraph and STEP 7-GRAPH. The trainer package also contains the S7 simulation software PLCSIM. Using the simulation software S7-PLCSIM it is possible to carry out the functional test of the SIMATIC S7 user blocks on PG/PC regardless of the availability of the target hardware. Recognition of program errors and their removal are therefore possible at a much earlier stage in development.

Your advantage:
– Faster, cost-reduced initial commissioning
– Increased program quality

S7-PLCSIM can be used for all user blocks and a selection of existing system functions which have been created in one of the following programming languages STL, LAD, FCH, STEP 7-GRAPH, STEP 7-HiGraph, and STEP 7-SCL. The Trainer Pacakge also contains 48 copies of the Software for Students (IL LD, FUC, PLCSIM) with a 120-day license.

The trainer package consists of 12 licenses on CD-ROM and 3.5" diskettes. Documentation as PDF files.

Note:
This package can only be ordered by non-industrial users (e.g. schools, technical colleges, universities, and training centers).

Order no. 531 141
(German, English, French, Spanish, Italian)

Programming software Siemens
Instructor Package STEP 7
Upgrade to current version

PLC technology

Scope as for STEP 7 Instructor Package (Order no. 531 141).

Note:
Not for sale to industry training establishments.

Order no. 531 142
(German, English, French, Spanish, Italian)

Programming software Siemens
Software for Students

PLC technology

Consisting of:
– 1 x homework software with 120-day license
– STEP 7 Basic V5.1 (SL, LD, FUC)
– S7-PLCSIM

Notes:
Not for sale to industry training establishments.
Prerequisite for purchase: Training center must have one STEP 7 Instructor Package (Order no. 531 141).

Order no. 531 143
(German, English, French, Spanish, Italian)

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Programming software Siemens SIMATIC S7 Software for Training

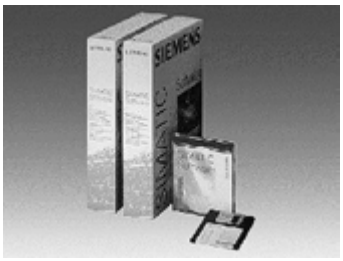
PLC technology

With a STEP 7 Professional license (IL, LD, FUC, SCL, GRAPH, PLCSIM) for industry training establishments (company training centers).

Note:
This package can be sold to non-industry training centers in addition to a STEP 7 Instructor Package (Order no. 531 141) if an additional Instructor Package would be excessive.

Order no. 531 144
(German, English, French, Spanish, Italian)

Programming software Siemens STEP 5



System requirements:
– PC with MS-DOS, Win 3.x/95/98/NT
– At least 80286
– 4 MB RAM
– 3.5“ disk drive or
4-speed CD-ROM drive

PLC technology

STEP 5 is the tried and tested programming software for the programmable logic controllers Simatic S5. STEP 5 can be programmed in 3 languages: STL, LAD and FUC.

The software is supplied based on CD-ROM and 3.5" disks.

Order no. 094 449
(German, English, French, Spanish, Italian)

Siemens documentation for programming software

PLC technology

Title	German	English
STEP 7 Fundamentals*	184 563	184 564
STEP 7 Reference manual STL, LAD, FCH	184 565	184 566
Manual STEP 7-SCL	193 132	193 133
Manual STEP 7-GRAPH	193 130	193 131
Programming manual for Siemens STEP 5	094 447	094 448

* The package comprises:
– Booklet “S7-300 simply assemble and program”
– User's manual STEP 7
– Programming manual S7-300/400
– Converter manual

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Software
Programming and visualizing

Siemens documentation for S7/STEP 7 on CD-ROM

System requirements:
– PC with Win 95/98/2000/NT
– 4-speed CD-ROM drive

PLC technology

The CD-ROM contains all manuals for:
– S7-200/300/400
– M7-300/400
– STEP 7 IN/LD/FUC/GRAPH/SCL
– SIMATIC HMI/NET/DP

Edition 2000, CD-ROM

Order no. 192 883
(German, English, French, Spanish, Italian)

InTouch

System requirements:
– PC with Win 95/98/NT
– At least Pentium 100 MHz
– 64 MB RAM
– Approx. 100 MB space on hard disk
– 8-speed CD-ROM drive

Process visualization

InTouch is an interactive system for visualizing, monitoring and controlling industrial processes on IBM compatible computers.

The package comprises the InTouch development and runtime version for Windows with 256 PLC variables, the NetDDE driver, the standard Wizard library and the EZDDE driver for communication with the Festo controllers FPC100, FPC202, FPC404, FEC, IPC and the Bürkert controller in the process control unit. Drivers for other PLC systems are available on demand.

A short manual is supplied on the CD-ROM as a PDF file. Context-related help texts provided by the software often render references to the manual superfluous. The software is supplied with a dongle.

Supplied on CD-ROM.

Order no. 192 108 (German, English)

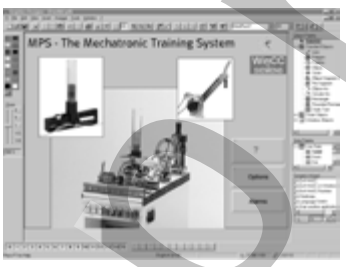
InTouch manual

Process visualization

Detailed description of software handling and of the functions for the creation of visualization applications.

Order no. 095 241 (German)
Order no. 095 242 (English)

WinCC
WinCC Trainer Package



System requirements:
– PC with Win 95/98/NT
– At least Pentium 200 MHz
– 32 MB RAM
– Approx. 100 MB space on hard disk
– 8-speed CD-ROM drive

Process visualization

SIMATIC WinCC is a PC-based control and monitoring system.

WinCC is designed for the visualization and control of processes, sequences, and machines. Its powerful process coupling, particularly to the SIMATIC family, and secure data archiving, mean that WinCC can offer highly available solutions for control and instrumentation (systems). The basic system – which is industry- and technology-generic – allows universal use in automation applications.

The package consists of a configuration (development) system and a runtime system for 256 variables (PowerTags). Coupling with S5, S7, and Profibus (DP) is integrated into the package. Coupling with other systems on request.

Supplied on CD-ROM, without documentation.

Single license
Order no. 195 439
(German, English, French)

Trainer Package (12 licenses)
Order no. 195 442
(German, English, French)

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WinCC documentation	Process visualization	Order no. 195 440 (German)

The WinCC basic documentation includes:
– WinCC manual (3 volumes)
– Description of software protection

WinCC configuration manuals	Process visualization	Order no. 195 441 (German)

Consists of:
– Project planning manual
– Communication manual
– Example CD-ROM

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Courseware
Pneumatics

Pneumatics, Basic level

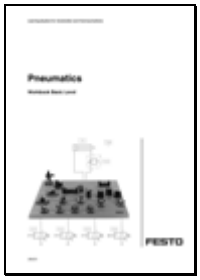
Textbook

Intended for basic training in pneumatic control technology. Teaches physical fundamentals of pneumatics, as well as the function and use of pneumatic elements. Numerous diagrams facilitate and ensure comprehension. Pneumatic controls are explained using examples. Model solutions and detailed explanations improve the student's knowledge of circuit design and sequences.
The software package FluidSIM® Pneumatics (see chapter Software) is a recommended supplement. Using this software you can design and simulate the example circuits supplied on a PC immediately. Fast and lasting learning success is guaranteed.

P. Croser, F. Ebel
Edition 1999, 276 pages, bound

Order no. 093 130 (German)
ISBN 3-540-66444-0
Order no. 093 131 (English)
Order no. 093 132 (French)
Order no. 093 137 (Spanish)

Pneumatics, Basic level



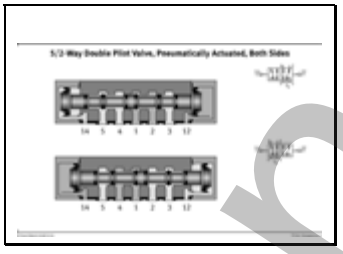
Workbook

This workbook is designed for basic training in pneumatic control technology. The learning content is presented in the form of 20 exercises which teach the physical fundamentals of pneumatics and the function and use of pneumatic elements, designation and drawing of pneumatic symbols, representation of motion sequences and circuit states, drawing pneumatic circuit diagrams according to the standard, various types of control systems, troubleshooting and safety regulations.
You will need equipment set Pneumatics, Basic level TP 101 to carry out the exercises.

D. Waller, H. Werner
Edition 1998, 238 pages, in binder

Order no. 094 000 (German)
Order no. 094 001 (English)
Order no. 197 530 (English – USA)
Order no. 094 384 (Spanish, incl. Order no. 093 137)

Fundamentals of Pneumatics



Transparency sets

New:
– Fully revised version
– All symbols compliant with DIN/ISO 1219
– Includes CD-ROM with PDF files of transparencies

Training aims include fundamentals of pneumatics, display of motion sequences and circuit states, direct and indirect directionally dependent circuits, logic AND/OR functions of the start-up signal, time-dependent circuits with a pressure sequence valve, and troubleshooting in simple pneumatic circuits.
The text page contains the complete image of the transparency with additional explanations and descriptions that can be entered on the transparency.

F. Ebel
Edition 2000, 52 transparencies, with CD-ROM, in binder

Order no. 095 000 (German)
Order no. 095 001 (English)
Order no. 095 003 (Spanish)

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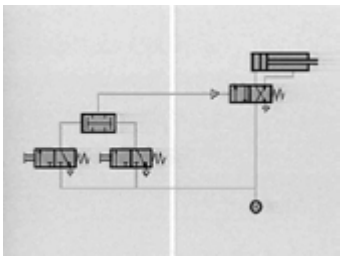
Pneumatics, Basic level



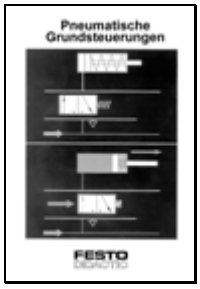
Video

This training film covers physical fundamentals, air pressure supply and preparation, and carrying out various motions with pneumatic drives. It shows valves and their use in purely pneumatic displacement, pressure, time and logic controls. The video shows examples from industrial practice, functional sequences (in the form of animations), and basic circuits (as structured assemblies).

R. Mayer, T. Schwer
Edition 1990, 48 minutes, VHS (PAL), 28-page guide

Order no. 095 100 (German)
Order no. 095 101 (English)
Order no. 094 360 (Spanish)
Order no. 120 600 13 (Dutch)

Basic pneumatic controllers



Practical knowledge

This booklet contains basic information on the function of pneumatic components and the design of pneumatic controls. It has been created for practical purposes, allowing people to quickly implement small projects. A large number of simple tasks can be derived from the various circuit examples. The examples shown are complementary.
This brochure also serves as a reference work. It gives an overview of the most important circuit planning symbols, shows the structure of controllers and gives hints on the practical implementation of circuit diagrams that have been developed.

W. Braungard, P. Löbelenz, G. Mark
Edition 1996, 40 pages, booklet

Order no. 151 508 (German)

Fundamentals of pneumatic control technology

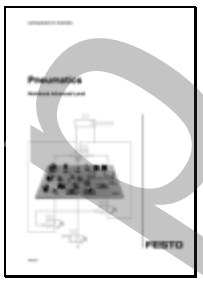
Textbook

Fundamentals of control technology, pneumatic controls, circuit design, exercises, and drawing pneumatic symbols are explained in this textbook.
Readers and seminar attendees will be able to solve simple control problems and develop circuit diagrams. Includes an introduction to general fundamentals of control technology, symbols, definition of terms, and covers topics from basic controls to the systematic development of control systems.

J. P. Hasebrink, R. Kobler, S. Idler
Edition 1985, 101 pages, bound

Order no. 090 850 (German)
Order no. 090 851 (English)
Order no. 090 857 (Spanish)

Pneumatics, Advanced level



Workbook

The workbook Pneumatics, Advanced level is intended for further training in pneumatic control technology. Following on from the learning content presented at basic level, additional types of control systems such as stroke-dependent controls, controls with start, setting time and safety conditions, with vacuum elements and step-diagram and time-program controls are the central topics in 20 exercises.
You will need equipment set Pneumatics, Advanced level TP 102 to carry out the exercises.

C. Ruoff, D. Waller, H. Werner
Edition 1999, 312 pages, in binder

Order no. 094 002 (German)
Order no. 094 003 (English)
Order no. 094 335 (Spanish)

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Courseware
Pneumatics

Pneumatics

BIBB course

Recommended and published by the German Federal Institute for Vocational Training Bundesinstitut für Berufsbildung (BIBB).

Contents:
Physical fundamentals, single-acting cylinder, 3/2-way valve, double-acting cylinder, 4/2- and 5/2-way valves, flow-control valve, one-way flow-control valve, supply-air and exhaust-air flow control, structure of a circuit diagram, 5/3-way valve, quick-exhaust valve, shuttle valve and dual-pressure valve, time-delay valve, displacement-step diagram, application examples.
The BIBB Pneumatics equipment set is designed for the BIBB course.

The BIBB Pneumatics consists of:

– Control engineering, pneumatics, fundamentals and application examples
  Edition 1999, 172 pages, in binder — Order no. 090 070 (German), ISBN 3-410-70435-3
– Pneumatics, tasks, log sheets, exercise circuits
  Edition 1999, 48 pages, loose-leaf — Order no. 090 090 (German), ISBN 3-410-70437-X

Electropneumatics, Basic level

Textbook

This textbook is an impressive synthesis of years of experience in courses at Festo Didactic and the requirements of company and school training.
Basic equipment and installation-saving modern components are described that require little maintenance. An extensive description of methods of representation showing motion sequences and circuit states make complex circuits easy to understand. A detailed example provides the student with the necessary knowledge for planning and implementing an electropneumatic circuit.

G. Prede, D. Scholz
Edition 2001, 296 pages, bound

Order no. 091 180 (German)
ISBN 3-540-41446-0
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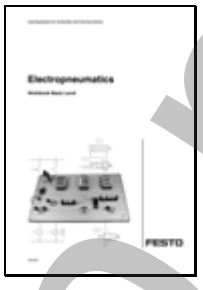
Order no. 090 872 (French)
Order no. 090 877 (Spanish)

Electropneumatics, Basic level

Workbook



This workbook offers in 20 exercises training in physical fundamentals of electricity and pneumatics, function and application of electropneumatic components, representation of motion sequences and circuit states, drawing pneumatic and electrical circuit diagrams, assembly of different control systems, as well as the use of switches and troubleshooting in simple electropneumatic control systems.
You will need equipment set Electropneumatics, Basic level TP 201 to carry out the exercises.

C. Ruoff, H. Werner
Edition 1998, 180 pages, in binder

Order no. 094 452 (German)
Order no. 094 466 (English)
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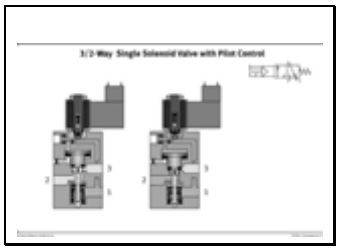
Fundamentals of Electropneumatics



Transparency sets

New:
– Fully revised version
– All symbols compliant with DIN/ISO 1219
– Includes CD-ROM with PDF files of transparencies

The transparency set shows the fundamentals of electropneumatics. The following subject matter is covered: function and use of electropneumatic components, drawing pneumatic and electropneumatic circuit diagrams according to the standard, representation of motion sequences and circuit states, direct and indirect controls. The text page contains the complete image of the transparency with additional explanations and descriptions that can be entered on the transparency.

F. Ebel
Edition 2000, 42 transparencies, with CD-ROM, in binder

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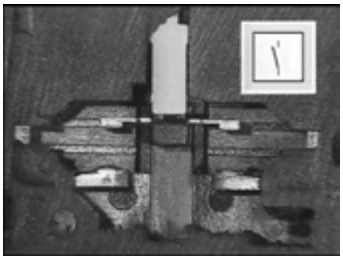
Order no. 095 011 (English)
Order no. 095 246 (Spanish)

Electropneumatics/Electrohydraulics, Basic level



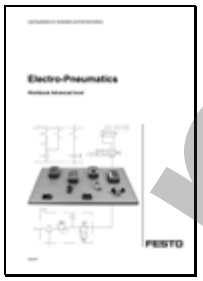
Video

This video primarily covers electrical controllers. In addition to an introduction to electrical engineering, it shows the most important switching elements and basic circuits. Practical applications alternate with animations and circuit examples.

R. Mayer, T. Schwer
Edition 1993, 48 minutes, VHS (PAL), 20 page guide

Order no. 095 110 (German)
Order no. 095 111 (English)
Order no. 094 451 (Spanish)

Electropneumatics, Advanced level



Workbook

The workbook focuses on additional control systems such as stroke-dependent control systems with sensors, with preselect counter, control systems with additional conditions, step-diagram and time-program control systems, program control systems with latching and resetting sequence and troubleshooting in extensive electropneumatic control systems.
You will need equipment set Electropneumatics, Advanced level TP 202 to carry out the exercises.

C. Ruoff, H. Werner
Edition 1999, 240 pages, in binder

Order no. 094 453 (German)
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Courseware
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Electropneumatics

BIBB course

Recommended and published by the German Federal Institute for Vocational Training (Bundesinstitut für Berufsbildung(BIBB)).

This series of exercises is designed for vocational and continuing training in the field of electrical control of pneumatic systems. It primarily covers relay and contactor controls, which are still in quite widespread use. The appendix gives an introduction to programmable logic controllers. The background for this is covered in the previous exercises.
The BIBB Electropneumatics equipment set is designed for the BIBB course.

The BIBB course Electropneumatics consists of:

– Control engineering electropneumatics, fundamentals and application examples Edition 1999, 160 pages, loose-leaf	Order no. 093 070 (German) ISBN 3-410-70436-1
– Electropneumatics, exercises, log sheets, practice circuits Edition 1999, 40 pages, loose-leaf	Order no. 093 080 (German) ISBN 3-410-70438-8

Closed-loop control pneumatics

Workbook

Order no. 094 459 (German)
Order no. 094 465 (English)
Order no. 094 337 (Spanish)

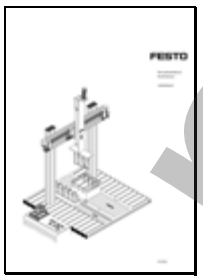
21 exercises offer a practical introduction to closed-loop control pneumatics. Besides fundamentals, the workbook covers subjects such as function of various controllers and control circuits, empirical setting of parameters of controllers, and the influence of interference variables.
You will need equipment set Closed-loop control pneumatics, TP 111 to carry out the exercises.

J. Gerhartz, D. Scholz
Edition 2001, 542 pages, in binder

Servopneumatic positioning

Workbook

Order no. 192 503 (German)
Order no. 196 949 (English)



The workbook gives a practice-oriented introduction to servopneumatics with 12 exercises and solutions. It covers such topics as: the structure of a pneumatic NC axle, programming in accordance with DIN 66025, parameterization of a status controller and coordination of motion sequences. The function and structure of the equipment used is described in detail.
Depending on the exercise at hand, practicals will require the equipment sets PneuPos 1, PneuPos 1 and 2 or PneuPos 1 to 3.

D. Scholz, H.-J. Eberhardt
Edition 2000, 290 pages, in binder

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Maintenance of pneumatic equipment and systems

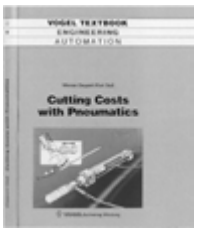
Textbook

The text is intended for service and installation personnel. The book covers such subjects as preparing compressed air, and basic circuits. Special attention is given to functional sequences, circuit diagrams and circuit assembly. A series of carefully researched practical examples, explained in full detail, renews and deepens the knowledge gained. An analysis of possible errors and applications for individual elements is helpful in practice. Varied displays of functional and exploded drawings allow maximum penetration of the material.

H. Meixner, J. Behr
Edition 1991, 252 pages, bound

Order no. 093 175 (German)
Order no. 090 841 (English)

Cutting costs with pneumatics



Technical book

Offers descriptions of selected examples, exercises and problems from real life, with solutions primarily from the viewpoint of 'Low-cost automation'. Addresses practitioners concerned with the design and use of pneumatic components and systems. Beginners are gently introduced to field of pneumatics.

K. Stoll
Edition 1999, 335 pages, bound

Order no. 052 660 (German)
ISBN 3-8023-1802-1
Order no. 052 656 (English)
Order no. 052 648 (French)

The amazing world of pneumatics
Impressions and innovations

Technical book

The amazing world of pneumatics uses countless examples to show the range of applications of air. The book also gives a short history of this technology. But above all, it shows the direction in which air-driven systems are developing. Vendor-independent and exciting.
The amazing world of pneumatics is not a textbook, but a book full of ideas – showing all the different things you can do with air and giving some idea of what pneumatics will look like in future.

Gerhard Vogel, Eugen Mühlberger
Edition 2002, 208 pages, bound

Order no. 053 977 (German)
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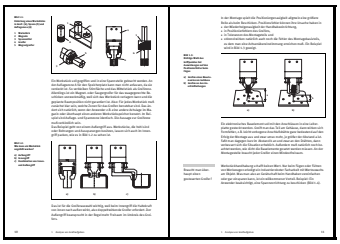
Blue Digest on Automation

Special automation knowledge



The Blue Digest on Automation book series contains specialized knowledge in condensed form as well as trend-oriented fundamentals of automation.
The digest form was selected to make the content accessible despite the daily flood of information. It is ideally suited as a compendium of existing literature.

For details of contents: www.festo.com/didactic.

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S. Hesse	Rationalization with handling technology		053 583		053 843
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B. Lotter	Manufacturing Assembly Handbook		054 119		
S. Hesse	Modular pick-and-place devices	053 752	053 753	053 754	
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Producing ever more product variants in ever smaller quanitites at the same high quality but at lower cost necessarily requires lean production. The change from one production unit to another also requires a change process. In order to achieve this successfully, managers have to ask themselves three basic questions.
The authors have examined these questions and have developed a special Change Management System as a result. With examples and case studies.

Holger Regber, Klaus Zimmermann
Edition 2001, 368 pages, bound

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This large-size DIN A1 poster is the medium for clear and striking representation of difficult subjects. Fixed to a wall, it provides all those in the room with a fast, comprehensive overview.

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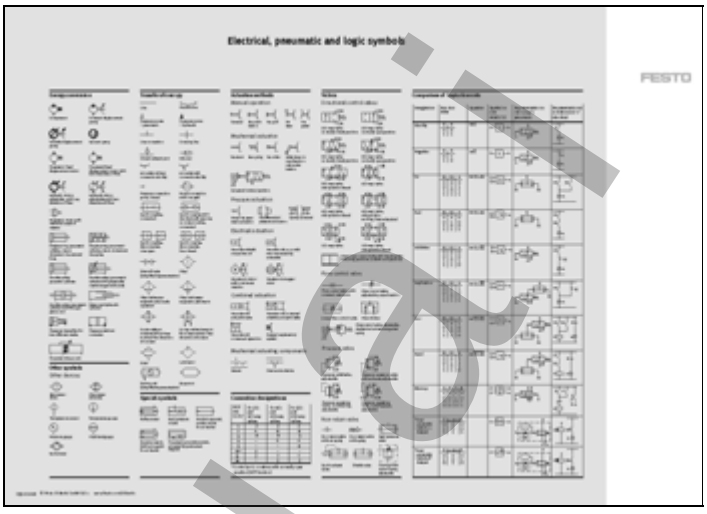
Electrical, pneumatic and logic symbols



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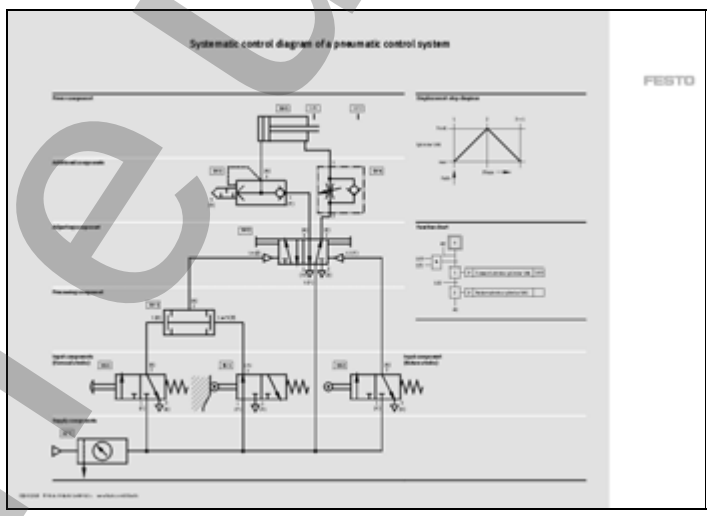

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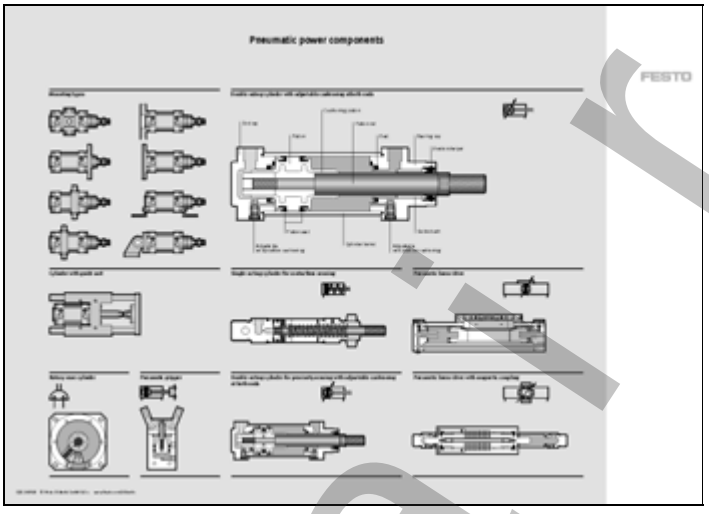

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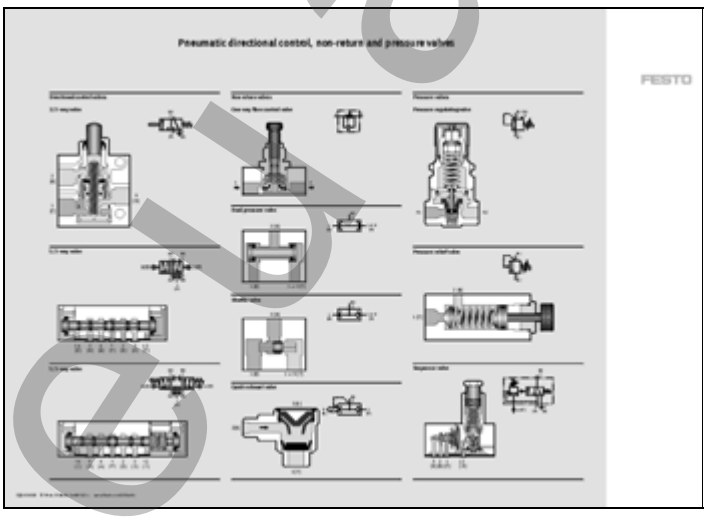

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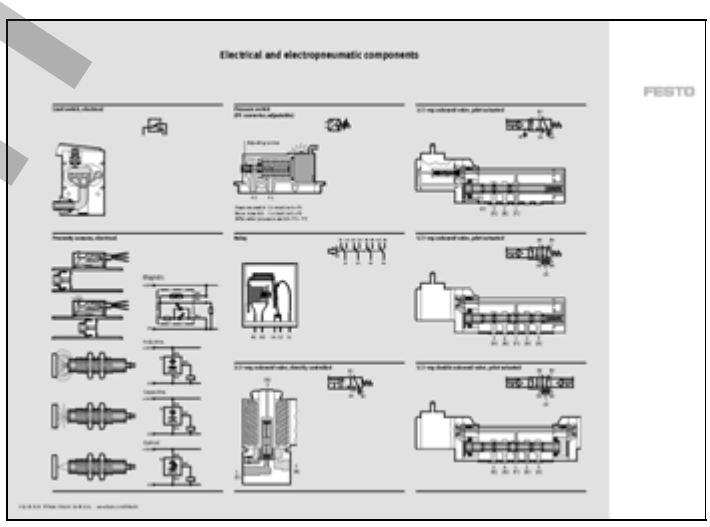
Electrical and electropneumatic components



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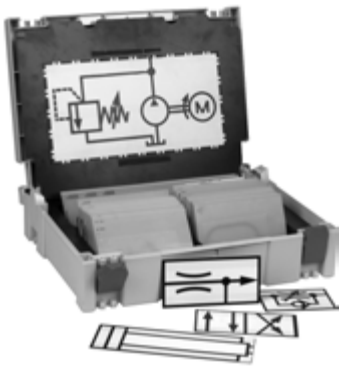
Magnetic symbol sets

Additional accessories



Developing circuit diagrams step by step.

The symbols are stuck to a metal-based board. Connections and designations are marked with chalk. The sets are stored in a Systainer.

Magnetic symbol sets Pneumatics/Hydraulics	Order no. 162 340
Magnetic symbol sets Electrical engineering	Order no. 162 341

Cutaway model case Pneumatics

Additional accessories

Making structure and function of pneumatic elements easy to understand.

All of the cutaway models used are of industrial design. Dynamic elements and plugs correspond to the original cutaway model. Models relevant to pneumatic training were selected. The models are divided into two sets and each stored in a Systainer. The collection is geared to the other components in the pneumatic technology packages.

Cutaway models, set 1	Order no. 162 342
Cutaway models, set 2	Order no. 162 343

Drawing template

Additional accessories

The drawing templates for control technology. Used to design pneumatic circuit diagrams or flow diagrams.

Which all electrical (DIN 40713), electronic (DIN 40719), pneumatic, hydraulic (DIN/ISO 1219) and logic symbols (DIN 40700) can be drawn.

Control technology template	Order no. 090 021
Program flowchart template	Order no. 090 022

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Courseware
Hydraulics

Hydraulics, Basic level

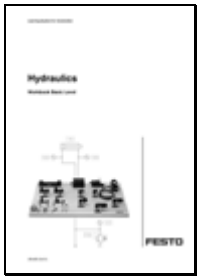
Textbook

The textbook covers the basics of hydraulic control technology. The practical exercises with model solutions illustrate the most important basic hydraulic circuits. Numerous illustrations help the reader to understand the descriptions. Directional-control and flow-control valves, pumps, motors and cylinders are described in detail. Filters, piping, pipe connectors and measuring instruments are also covered. An extensive list of standards rounds out the book.

D. Merkle, B. Schrader, M. Thomes
Edition 1997, 284 pages, bound

Order no. 093 280 (German)
ISBN 3-540-62091-5
Order no. 093 281 (English)
Order no. 093 282 (French)
Order no. 093 287 (Spanish)

Hydraulics, Basic level



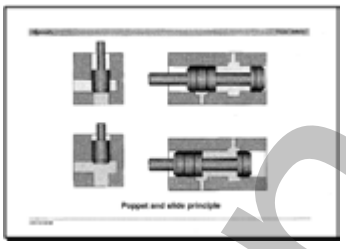
Workbook

The 20 exercises in this book are used to present hydraulic circuits. The circuit diagrams use circuit symbols in accordance with DIN/ISO 1219. The following subjects are dealt with: Characteristics of pumps and pressure relief valves, single and double acting cylinders, advance- and return stroke speed, travel and back pressure, rapid-traverse feed circuit, differential circuits, counterbalancing and pressure relief valves, pressure sequence circuits, pressure control valves, 3/2-, 4/2- and 4/3-way valves, hydraulically-piloted non-return valves, one-way flow control valves, orifices, flow control valves.
You will need equipment set Hydraulics, Basic level TP 501 to carry out the exercises.

A. Zimmermann
Edition 1998, 268 pages, in binder

Order no. 094 454 (German)
Order no. 094 468 (English)
Order no. 526 095 (English – USA)
Order no. 094 428 (Spanish)

Fundamentals of Hydraulics



Transparency sets

The most important components used in hydraulic control technology are shown on 28 transparencies; these cover directional pressure and flow control valves of poppet and spool design, single- and double-acting cylinders, pumps and measuring devices for pressure and flow rate.
An accompanying sheet with technical and didactic notes is provided for each transparency.

T. Ocker
Edition 1989, 28 transparencies, in binder

Order no. 095 040 (German)
Order no. 095 041 (English)
Order no. 095 042 (French)
Order no. 095 043 (Spanish)

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Hydraulics, Basic level

Video

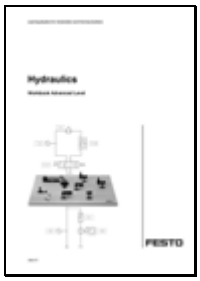
This training film deals with the most important physical principles of hydraulics, the assembly of hydraulic circuits and basic hydraulic components in typical basic circuits. Great emphasis is placed on practical examples which demonstrate the broad range of application of hydraulics. In addition to authentic images of applications and circuits, the mode of operation and interaction of components are shown in animated film sequences.

R. Mayer, T. Schwer
Edition 1991, 55 minutes, VHS (PAL), 36-page booklet

Order no. 095 140 (German)
Order no. 095 141 (English)
Order no. 094 361 (Spanish)
Order no. 120 600 34 (Dutch)

Hydraulics, Advanced level

Workbook



The exercises in this book are used to present hydraulic circuits. The circuit diagrams use circuit symbols in accordance with DIN/ISO 1219. The following subjects are dealt with: Basic hydraulic circuits such as pressure sequence and dual pressure circuits, a bypass circuit to the pump, a differential circuit, circuits with flow control valves in the inlet, outlet and bypass, circuits with counter-holding, bypass circuits with a non-return valve, circuits to secure tractive loads, and motor and reservoir circuits.
You will need equipment set Hydraulics, Advanced level TP 502 to carry out the exercises.

T. Ocker
Edition 1999, 192 pages, in binder

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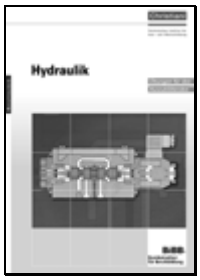
Hydraulics

BIBB course



Recommended and published by the German Federal Institute for Vocational Training (Bundesinstitut für Berufsbildung (BIBB).

Contents:
Physical fundamentals, power supply unit with gear pump, filter and tank, directional-control valves: 3/2-, 4/2- und 4/3-way valves, non-return valves, flow-control valve, 2-way flow-control valve, one-way flow control valve, pressure valves and pressure switches, pressure-relief valves and pressure-control valve, accumulator. Application circuits: differential circuit, fast-feed circuit, pressureless pump circulation. Hydraulic motor, commissioning and maintenance with troubleshooting.
The BIBB Hydraulics equipment set is designed for the BIBB course.

The BIBB Hydraulics course consists of:

– Booklet for instructor	Order no. 093 680 (German)
Edition 1993, 112 pages, in loose-leaf folder	ISBN 3-410-70271-7
– Exercises for the students	Order no. 093 685 (German)
Edition 1993, 138 pages, in loose-leaf binder	ISBN 3-410-70270-9
– Exercises and log sheets	Order no. 093 690 (German)
Edition 1999, 96 pages, loose-leaf	

Workbook — Order no. 093 024 (German)
Contains the above three BIBB course publications and the appropriate solutions. Designed for use with the Festo Didactic equipment sets.
462 pages, in binder

Fundamentals and equipment, calculations and application examples — Order no. 094 558 (German)
Documentation for training and professional use — ISBN 3-410-70174-5
This book is an standalone reference work that is based on the chapter structure of the book of exercises (Order no. 093 685) and contains further information.
Overview of contents:
Fundamentals (introduction, measuring technology), power supply unit (pressure media, pressure reservoirs, connectors, pumps, filters), directional control valves and motors (cylinders, hydraulic motors, semirotary actuators), shut-off valves and non-return valves, 2-way installation valves, flow-control valves, pressure valves and pressure-dependent electrohydraulic sensors, dynamic-control valves (proportional valves, servo valves), accumulators (diaphragm accumulator, bladder accumulator, piston accumulator, applications, calculations, safety devices, test regulations). Circuit technology and calculation (graphic symbols, circuit symbols, function diagrams, basic circuits, application examples, planning of systems), commissioning, preventive maintenance and repair.
Edition 1997, 256 pages, in binder

Transparencies for the series of exercises — Order no. 092 190 (German)
Cutaway drawings and functional diagrams of the most important hydraulic elements. — ISBN 3-410-70129-X
R. Gänger
Edition 2000, 24 transparencies, on CD-ROM

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Electrohydraulics, Basic level

Textbook

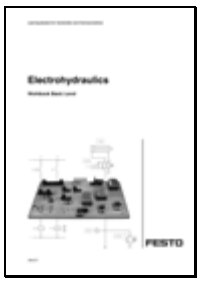
Thanks to the use of electrical control systems, many new areas of application have now been found for conventional hydraulics. Electrohydraulics can now be applied in many fields.
The book teaches the fundamentals of electrohydraulic control technology. The 12 exercises illustrate the basic electrical and hydraulic circuits. The book also describes the basic physical principles of electrical engineering and the function and design of the most important electrical and hydraulic components such as cylinders, valves, logic circuits, signal inversion, signal storage and sequence controls.

D. Merkle, K. Rupp, D. Scholz
Edition 1997, 203 pages, bound

Order no. 093 610 (German)
ISBN 3-540-62087-7
Order no. 093 611 (English)
Order no. 094 364 (Spanish)

Electrohydraulics, Basic level

Workbook



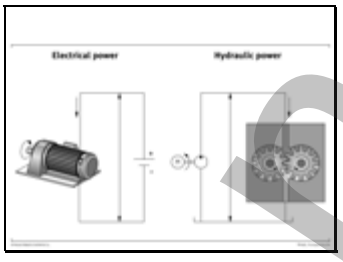
The 13 exercises are used to present the basic electrical circuits used in hydraulic control technology. The following subjects are dealt with: basic physical principles of electrical engineering and hydraulics, function and use of electrical and electrohydraulic components such as switches, pushbuttons and solenoid valves, direct and indirect activation of cylinders, activation of hydraulic motors, manual and automatic modes, position and pressure dependent control circuits, interlock circuits, rapid-traverse circuits, troubleshooting with simple electrohydraulic control circuits.
You will need equipment set Electrohydraulics, Basic level TP 601 to carry out the exercises.

D. Merkle, H. Werner
Edition 1998, 232 pages, in binder

Order no. 094 455 (German)
Order no. 094 470 (English)
Order no. 094 351 (French)
Order no. 196 953 (Spanish)

Fundamentals of Electrohydraulics

Transparency sets



New:
– Fully revised version
– All symbols compliant with DIN/ISO 1219
– Includes CD-ROM with PDF files of slides

This set of overhead transparencies has been designed for use with basic level electrohydraulics. The 32 transparencies in this set have been designed in accordance with didactic and methodological principles. Each transparency is accompanied by a short text which provides the trainer with a quick overview of the training contents of the transparency concerned. The following subjects are dealt with: basic principles of electrohydraulics, function and use of electrohydraulic components, basic principles of electrical engineering, production and interpretation of standard hydraulic and electrical circuit diagrams.
The text sheet includes a complete illustration of the transparency, in certain cases with additional explanations and legends which the trainer can enter on the transparency in the course of a training session.

T. Ocker, D. Scholz
Edition 2001, 30 transparencies, with CD-ROM, in binder

Order no. 095 050 (German)
Order no. 095 051 (English)

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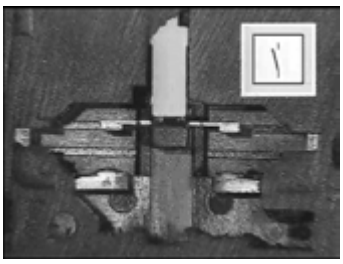
Courseware
Hydraulics

Electropneumatics/Electrohydraulics, Basic level



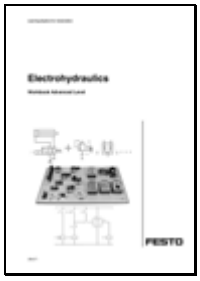
Video

This video primarily covers electrical controllers. In addition to an introduction to Electrical engineering, it shows the most important switching elements and basic circuits. Practical applications alternate with animations and circuit examples.

R. Mayer, T. Schwer
Edition 1993, 48 minutes, VHS (PAL), 20-page guide

Order no. 095 110 (German)
Order no. 095 111 (English)
Order no. 094 451 (Spanish)

Electrohydraulics, Advanced level



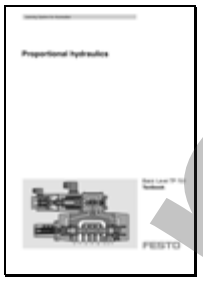
Workbook

The 10 exercises in this book are used to present the basic electrohydraulic circuits. The following subjects are dealt with: function and use of electronic sensors, hydraulic motors and hydraulic accumulators, complex sequence controls, combined position- and pressure- dependent control circuits, electrical control circuit with several actuators, sequence controls with manual/automatic, emergency stop and setting modes, systematic troubleshooting in electrohydraulic control circuits, controls with timer relays with pick-up and drop-off delays, counter controls with predetermining counters.
You will need equipment set Electrohydraulics, Advanced level TP 602 to carry out the exercises.

D. Merkle, A. Zimmermann, H. Werner
Edition 1999, 174 pages, in binder

Order no. 094 456 (German)
Order no. 094 471 (English)
Order no. 196 954 (Spanish)

Proportional hydraulics, Basic level



Textbook

How can speed be controlled? How is a position held? How does one avoid leakage. And where and when can energy be conserved? The reader will find the answers to these questions – and more – in this textbook.
This book provides a clear and easy-to-understand introduction to the fundamentals of proportional hydraulics. A description is given of the design and function of valves for the control of pressure, direction of flow and flow rate. This covers variants both with and without piloting and with and without position control. The book then goes on to deal with setpoint generation and proportional amplifiers, with a detailed description of the function of these and the correct way to achieve optimum settings. Calculation fundamentals are shown using the example of drives with double-acting cylinders.

D. Scholz
Edition 1997, 123 pages, bound

Order no. 094 377 (German)
ISBN 3-540-62088-5
Order no. 094 378 (English)

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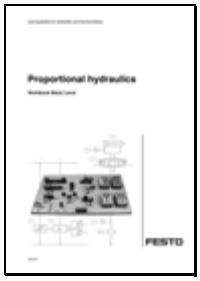
Proportional hydraulics, Basic level



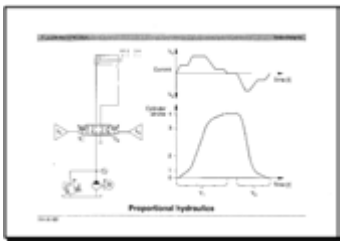
Workbook

10 exercises give an introduction to proportional hydraulics equipment and circuits. First, the individual devices are presented and their settings tried out. These are single-channel and two-channel amplifiers, proportional pressure valves and the 4/3-way proportional valves. Then a complete solution is developed based on a series of graduated exercises.
The system includes the following elements: setting basic current, jump current and maximum current for single-channel and two-channel amplifiers, getting to know the proportional pressure relief valve and the 4/3-way proportional valve, setting the various ramps and positioning by means of exact deceleration.
You will need equipment set Proportional hydraulics, Basic level TP 701 to carry out the exercises.

D. Scholz, A. Zimmermann
Edition 1998, 338 pages, in binder

Order no. 094 457 (German)
Order no. 094 472 (English)
Order no. 094 352 (French)
Order no. 094 404 (Spanish)

Fundamentals of Proportional hydraulics



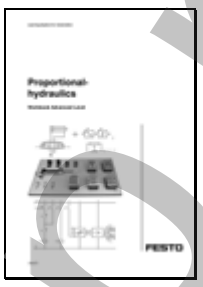
Transparency sets

This set of overhead transparencies has been designed for use with basic level of proportional hydraulics in accordance with didactic and methodological principles. Each transparency is accompanied by a short explanatory text which provides the trainer with a quick overview of the training contents of the transparency concerned. The following subjects are dealt with: fundamentals of proportional hydraulics, function and use of proportional hydraulic components, electronic components for the actuation of proportional valves, comparison with electrohydraulic control systems.
The text sheet includes a complete illustration of the transparency, in certain cases with additional explanations and legends which the trainer can enter on the transparency in the course of a training session.

F. Ebel, T. Ocker
Edition 1994, 28 transparencies, in binder

Order no. 095 060 (German)
Order no. 095 061 (English)

Proportional hydraulics, Advanced level



Workbook

The most important devices and circuits of proportional hydraulics are covered in 10 exercises. The following topics are covered: Function and structure of displacement, pressure and temperature sensors, circuits for the evaluation of sensor signals, time-, displacement- and temperature-dependent control of hydraulic cylinders, logical association of individual processes to an overall process.
You will need equipment set Proportional hydraulics, Advanced level TP 702 to carry out the exercises.

E. Bauer
Edition 1999, 240 pages, in binder

Order no. 094 458 (German)
Order no. 094 473 (English)
Order no. 094 450 (Spanish)

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Courseware
Hydraulics

Closed-loop control hydraulics

Workbook

The training aims are concerned with learning the fundamentals of analog control technology. The 21 exercises cover the following main topics: pressure control with PID controller, position control with PID controller, position control with status controller.
The fundamentals dealt with concern: classification of hydraulic controlled systems, description of different controller structures, notes regarding technical implementation of controllers, valves and sensors, tips on the assembly and commissioning of hydraulic closed control loops.
You will need equipment set Proportional hydraulics Closed-loop control hydraulics, TP 511 to carry out the exercises.

A. Zimmermann
Edition 2000, 584 pages, in binder

Order no. 094 460 (German)
Order no. 094 469 (English)
Order no. 094 348 (French)
Order no. 094 368 (Spanish)

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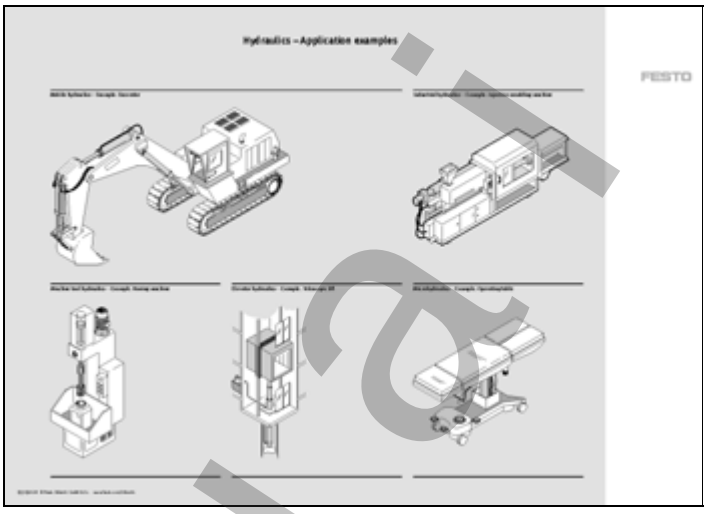
Posters

This large-size DIN A1 poster is the medium for clear and striking representation of difficult subjects. Mounted on a wall, it provides all those in the room with a fast, comprehensive overview.

Hydraulics poster set:
The 5 hydraulics posters shown below, published as a set.
Order no. 196 948 (German)

Application examples for hydraulics



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Order no. 053 032 (English)
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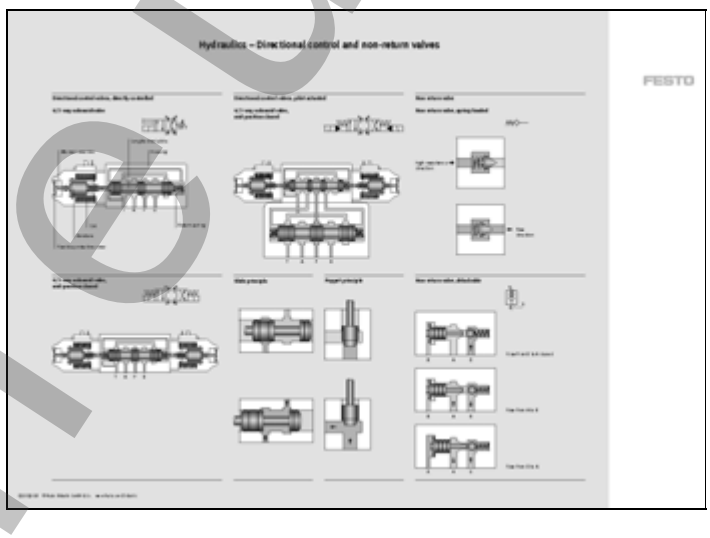
Directional control and non-return valves in hydraulics



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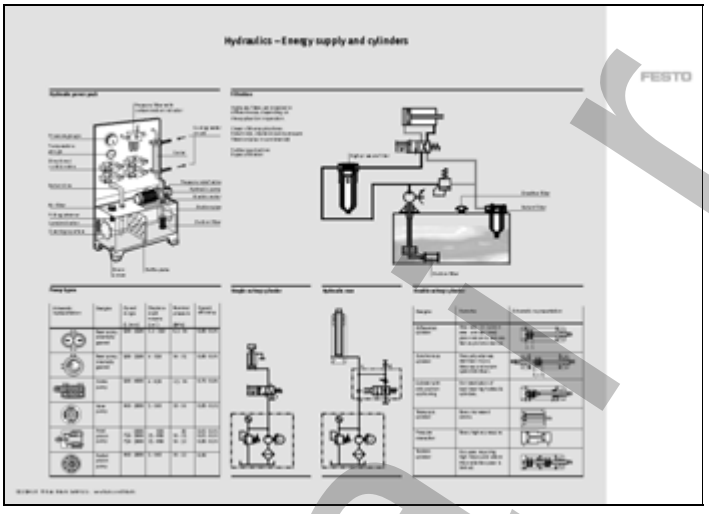
Courseware
Hydraulics

Hydraulic energy supply and cylinders



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Order no. 053 034 (English)
Order no. 053 478 (Spanish)
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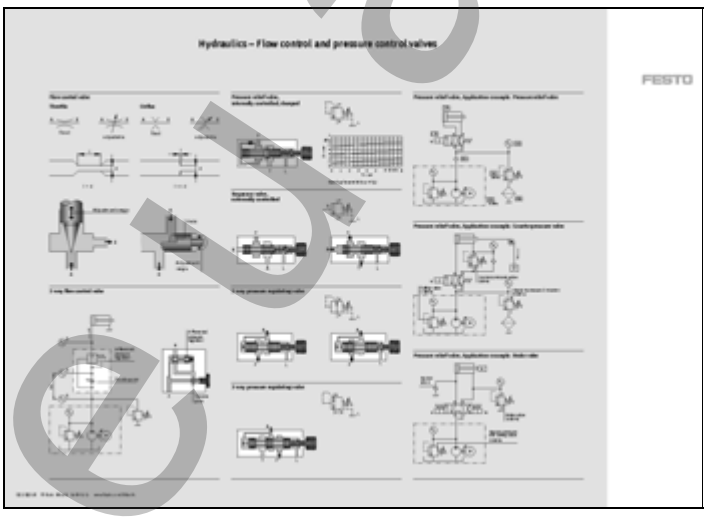
Flow control and pressure control valves in hydraulics



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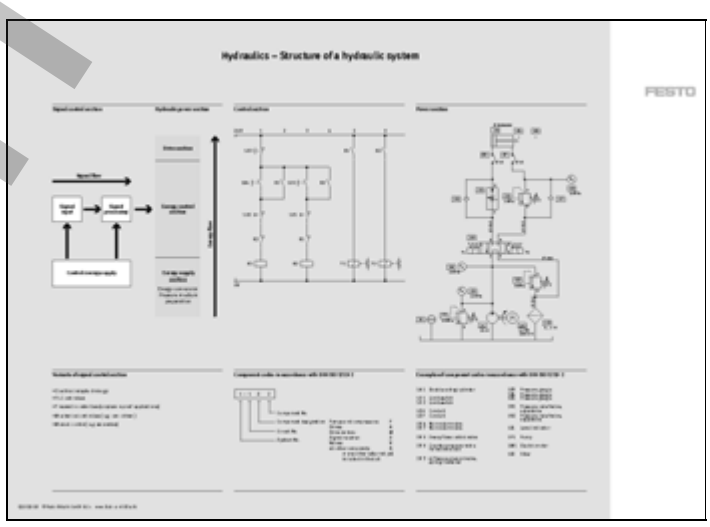
Structure of hydraulic system



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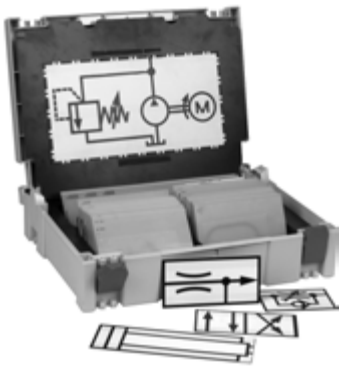
Magnetic symbol sets

Additional accessories



Developing circuit diagrams step by step.

The symbols are stuck to a metal-based board. Connections and designations are marked with chalk. The sets are stored in a Systainer.

Magnetic symbol sets Pneumatics/Hydraulics	Order no. 162 340
Magnetic symbol sets Electrical engineering	Order no. 162 341

Drawing templates

Additional accessories

The drawing templates for control technology. Used to design pneumatic circuit diagrams or flow diagrams.

Which all electrical (DIN 40713), electronic (DIN 40719), pneumatic, hydraulic (DIN/ISO 1219) and logic symbols (DIN 40700) can be drawn.

Control technology template	Order no. 090 021
Program flowchart template	Order no. 090 022

Hydraulic slide rule

Additional accessories

Order no. 032 195

This hydraulic slide rule provides an ideal means of calculating force, travel time, energy consumption, delivery rates etc.

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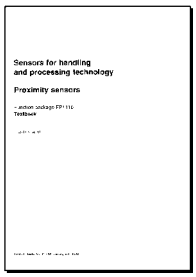
Courseware
Sensors

Proximity sensors

Textbook



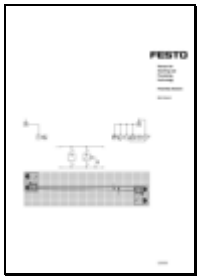
This sensor textbook deals in detail with proximity switches for handling and processing systems. The book can be used both to support basic and further training programs and for self-study. It is made up of a course section, a fundamentals section and a section with solutions to the exercises in the course section. The contents of the book are matched to the corresponding book of exercises while a glossary of key words provides rapid access to information on particular types of sensors.

F. Ebel, S. Nestel
Edition 1991, 336 pages, bound

Order no. 093 045 (German)
ISBN 3-8127-3045-6
Order no. 093 046 (English)
Order no. 094 342 (Spanish)

Proximity sensors

Workbook



The workbook has 19 exercises teaching the basic principles and the use of magnetic, inductive, capacitive and optical proximity switches, as well as those based on ultrasound technology.
You will need the equipment set Proximity sensors, FP 1110.

F. Ebel
Edition 2001, 304 pages, in binder

Order no. 529 938 (German)
Order no. 529 939 (English)
Order no. 192 168 (Spanish)

Sensors for distance and displacement

Workbook

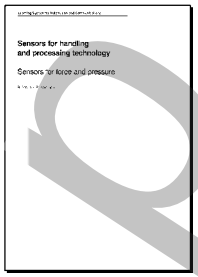
The workbook deals with distance measurement with inductive sensors, position measurement with linear potentiometers and with ultrasound sensors, and distance measurement with optical sensors. A total of nine exercises are provided for these four subjects.
You will need equipment set Sensors for distance and displacement, FP 1120 to carry out the exercises.

H. Dahlhof, K. Rupp, H. Werner, R. Schulé, S. Nestel
Edition 1992, 260 pages, in binder

Order no. 090 155 (German)
Order no. 090 156 (English)
Order no. 094 330 (Spanish)

Sensors for force and pressure

Workbook



This workbook deals with the mode of operation and range of applications of both digital sensors – such as mechanical and electronic pressure switches – and analog sensors, such as strain gauges and analog pressure sensors. The contents are didactically presented in 14 exercises.
A theoretical section illustrates the physical fundamentals. Numerous examples of industrial applications of force and pressure sensors allow practical use of the material which has been learned.
You will need equipment set Sensors for force and pressure, FP 1130 to carry out the exercises.

R. Schulé, P. Waiblinger
Edition 1992, 220 pages, in binder

Order no. 090 165 (German)
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Order no. 094 331 (Spanish)

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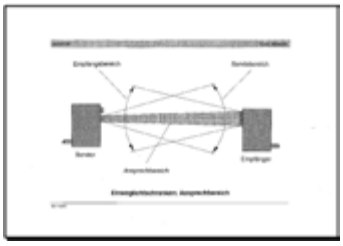
Sensors

Transparency sets

Order no. 093 960 (German)



This transparency set is designed to provide easy-to-understand presentation of the material of vocational school and technical college syllabuses. It supports the following topics: Measurement of non-electrical variables, sensor technology, process data processing, process technology, measurement, and open-loop and closed-loop control technology.
Contents:
Mode of operation of devices for measuring non-electrical variables, exercises and the interplay of measuring sensors, converters, amplifiers and visualization. Properties and applications of measuring sensors, examples of industrial versions of sensors, and measuring techniques.

S. Nestel
Edition 1995, 82 transparencies, in binder

Sensor modules in automation

Video

The application of sensors is clearly illustrated using the example of fully automatic part assembly.

Edition 1992, 5 minutes

VHS system (PAL)	Order no. 041 621 (German)
S-VHS system (PAL)	Order no. 041 623 (German)
S-VHS system (PAL)	Order no. 041 627 (English)

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Courseware
Electronics/PLC

PLC, Basic level

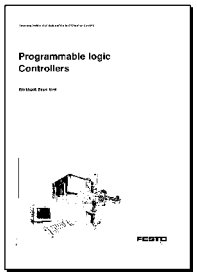
Textbook

Programmable logic controllers are an important element of automation technology. Using PLCs both adaptation to varying process sequences and fast trouble-shooting are possible.
Structure and mode of operation of PLCs are described. The programming standard DIN EN 61131-3 is the central topic of the book. This standard takes expansions and developments into account, for which up until now there were no standardized language. Beginners and users will find a detailed and easy-to-understand presentation of modern programming methods in accordance with the new standard for PLC programming. The solutions to the various examples are neutral and can therefore be used regardless of the PLC manufacturer.

R. Bliesener, F. Ebel, C. Löffler, H. Regber, E. v. Terzi, A. Winter
Edition 2002, 214 pages, bound

Order no. 093 310 (German)
ISBN 3-540-62090-7
Order no. 093 311 (English)
Order no. 093 317 (Spanish)

PLC, Basic level



Workbook

The workbook covers the structure and mode of operation of a PLC and the systematic development of PLC programs. The content is entirely based on the new DIN EN 61131-3 programming standard.
Practical exercises require a PLC and a real process such as TP 301 or a virtual process such as VEEP®2.

R. Bliesener, F. Ebel, C. Löffler, H. Regber, E. v. Terzi, A. Winter
Edition 2002, 530 pages, in binder

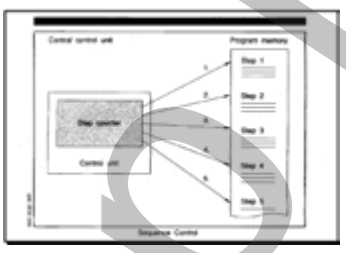
Order no. 093 313 (German)
Order no. 093 314 (English)
Order no. 094 427 (Spanish)

Solutions parts

Geared to the PLC Equipment set Basic Level TP 301, loose-leaf, with program listing and source source program on 3.5” disk.

Company-specific PLC	German	English
Festo FPC 101	093 315	093 316
Siemens S5-95U	093 332	093 333
Siemens S7-300 (IEC 1131-3)	094 524	094 537
Allen Bradley SLC500		094 440

Fundamentals of PLCs



Transparency sets

This transparency set was designed as an introduction to this technology and how to handle a programmable logic controller. Based on the textbook, Programmable Logic Controllers, Basic level, this set presents the basic function units of a PLC, the syntax of well-known programming languages IN, LD and FUC. Signal forms, the processing of binary signals and the mathematics of logic operations are illustrated.

Edition 1987, 26 transparencies, in binder

Order no. 092 271 (German)
Order no. 095 021 (English)

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Fundamentals of PLCs

Video

Order no. 091 590 (German)
Order no. 095 121 (English)

This film provides an introduction to PLC technology. Using practical examples, the film describes the criteria for using a PLC and shows the structure of a PLC controlled system. Function and processing sequences are explained in animated sequences. Much time is devoted to the illustration of sequence programs which have been realized in the programming languages Statement List, Ladder Diagram and Function Chart.

M. Kantel, R. Mayer, B. Plagemann
Edition 1988, 54 minutes, VHS (PAL), 14 page-guide

Programmable logic controllers in practice
Programming languages from STEP 7
Exercises and solutions

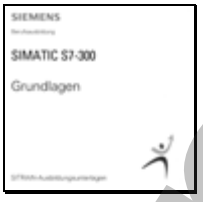
Textbook

Order no. 193 449 (German)
ISBN 3-528-03858-6

Using practice-oriented exercises, the book shows possible applications of the PLC, in this case the SIMATIC S7. In addition to the classical programming languages Instruction List (IL), Ladder Diagram (LD) and Function Chart (FUC), the book also contains several programming examples using the sequence language GRAPH, in SCL (Structured Control Language) – a PASCAL-like high-level language – and in HiGraph – a programming language that uses the state-graph method. The practice-oriented exercises with very detailed documentation of solutions cover logic controllers, sequence controllers, exercises with digital operations (word processing), analog value processing and operations with data modules. The more complex exercises relate to the stations of Festo Didactic's Modular Production System MPS®.

Werner Braun
Edition 2000, 334 pages, bound

SIMATIC S7-300
Basic level



Technical requirements:
– PC with Win 95
– Microsoft Office 97
– Autosketch 2.0 for graphic processing
– Acrobat Reader 3.01
– At least 80486
– 16 MB RAM
– CD-ROM drive

Siemens course

Order no. 194 042 (German)
ISBN 3-89578-104-5

The contents of the CD-ROM are designed for instructors in factories and teachers at schools of vocational and continuing education who teach automation. They are just as suitable for in-factory training as for the conduct of automation courses at vocational schools.
This comprehensive work contains a introduction to programmable logic controllers using the example of the SIMATIC S7-300. Based on program examples and sample solutions, it covers the following: Setup and wiring, control with STEP 7, logic control functions, memory, time and other functions, sequence control, shift functions, arithmetic with S7, analog value processing, fan control, star-delta control, level control, person-counting system, control of a conveyor model.
Text and images can be read and printed with Acrobat Reader, and the text can be processed in Microsoft Word, graphics can be processed with Autosketch. The book is supplemented by extracts from the S7 manuals and from the catalog ST70 CA 01 – these can also be read and printed with Acrobat Reader.

Edition 1999, CD-ROM

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Courseware
Electronics/PLC

Automating with SIMATIC
Integrated automation with the SIMATIC S7-300/400 controller, software, programming, data communication, operation and monitoring

Technical book

Totally Integrated Automation is the concept of the SIMATIC machines for control of production plant and industrial processes. Using the S7-300/400 programmable logic controller as an example, the reader is given an overview of the structure and mode of operation of a modern automation system. The book also covers project planning and parameterization of the controller and the distributed peripherals, explains communication via network connections and describes the ways in which a system can be operated and monitored. As a central automation tool, STEP 7 manages all exercises occurring and provides several text- and graphic-oriented PLC programming languages. The reader is given an introduction to the various languages and their differences.
The book is excellent for all readers who have little knowledge in the area and wish to learn more about programmable logic controllers.

Hans Berger
Edition 2000, 214 pages, bound

Order no. 194 039 (German)
ISBN 3-89578-132-0

Automation with STEP 7 in IL and SCL
SIMATIC S7-300/400 programmable logic controllers

Technical book

The SIMATIC S7 automation system allows implementation of industrial controllers for machines, manufacturing systems and process plant. The necessary open- and closed-loop control tasks are formulated in various programming languages using the STEP 7 programming software.
The book describes the elements and applications of the text-oriented programming languages Instruction List (IL) and Structured Control Language (SCL) both for the SIMATIC S7-300 and the SIMATIC S7-400. It is designed for all users of SIMATIC S7 controllers. Beginners are given an introduction to the area of programmable logic controllers, while users are shown the special applications of the SIMATIC S7 automation system.
All programming examples shown in the book – and several more besides – are archived in the module libraries on the accompanying diskette. These can be extracted, viewed in IL and SCL, copied into projects and tried out.
Contents:
System overview of SIMATIC S7 and STEP 7, programming languages IL and SCL, data types, binary and digital IL operations, program flow control, program execution, indirect addressing with IL and SCL control instructions.

Hans Berger
Edition 1999, 455 pages, with 3.5" diskette, bound

Order no. 194 040 (German)
ISBN 3-89578-113-4

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Documents Provided by Coast Pneumatics
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Automation with STEP 7 in LD and FUC
SIMATIC S7-300/400 programmable logic controller

Technical book

Order no. 194 041 (German)
ISBN 3-89578-124-X

The SIMATIC S7 automation system allows implementation of industrial controllers for machines, manufacturing systems and process plant. The necessary open- and closed-loop control tasks are formulated in various programming languages using the STEP 7 programming software.
The book describes the elements and applications of the graphic-oriented programming languages Ladder Diagram (LD) and Function Chart (FUC) both for the SIMATIC S7-300 and the SIMATIC S7-400. It is designed for all users of SIMATIC S7 controllers. Beginners are given an introduction to the area of programmable logic controllers, while users are shown the special applications of the SIMATIC S7 automation system.
All programming examples shown in the book – and several more besides – are archived in the module libraries on the accompanying diskette. These can be extracted, viewed in LD and FUC, copied into projects and tried out.
Contents:
System overview of SIMATIC S7 and STEP 7, programming languages LD and FUC, data types, binary and digital IL operations, program flow control, and program execution.

Hans Berger
Edition 1999, 356 pages, with 3.5" diskette, bound

Decentralization with PROFIBUS-DP
Setup, planning and application of PROFIBUS-DP with SIMATIC S7

Technical book

Order no. 194 043 (German)
ISBN 3-89578-123-1

In the area of distributed periphery (DP), the EN-compliant PROFIBUS-DP has – as a result of a broad range of connectable field devices – become an internationally accepted and recognized standard for the fieldbus system. In addition to basic knowledge of the PROFIBUS, the book focuses mainly on planning the PROFIBUS-DP with STEP 7, explaining the various possibilities for data exchange with application programs and giving tips for commissioning and troubleshooting. A range of practical application examples on the basis of SIMATIC programmable logic controller helps users put theory into practice.
The book describes new functions and applications of the PROFIBUS-DP in the SIMATIC S7 based on STEP 7 Version 5. This includes "direct" data exchange between PROFIBUS-DP slaves (lateral communication) and the setting of an equidistant DP bus cycle. The sections on commissioning and diagnostic functions have been revised and updated.
Because of its practical orientation, the book is particularly well suited to PROFIBUS planners, designers and programmers. The basic and extensive description also makes it ideal for students and instructors.

Josef Weigmann, Gerhard Kilian
Edition 2000, 220 pages, bound

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Courseware
Electronics/PLC

Pneumatic positioning system SPC 200

Manual

This manual contains general basic information about the mode of operation, assembly, installation, and commissioning of pneumatic axles using the pneumatic positioning system SPC 200 from Festo.

S. Breuer
Edition 1999, 370 pages, in binder with slipcase

Order no. 170 245 (German)
Order no. 170 246 (English)

Fast Soft Stop SPC 10

Manual

This manual contains general basic information about the mode of operation, assembly, installation, and commissioning of pneumatic axles using the fast Soft Stop SPC 10 from Festo.

S. Breuer
Edition 2000, 83 pages, bound

Order no. 192 943 (German)
Order no. 192 944 (English)

Supplementary descriptions for drives type DGP(L)
Address-specific supplement for the operation of the SPC10 with the Type DGP(L) drive.
S. Breuer
Edition 2000, 67 pages, bound

Order no. 192 949 (German)
Order no. 192 950 (English)

Programming with Festo FST

Manuals

These manuals give an introduction to programming the Festo PLC. They are also an ideal reference work for advanced users.

Statement list
R. Conde
Edition 1990, 196 pages, bound

Order no. 018 351 (German)
Order no. 018 352 (English)

Ladder diagram
B. Plagemann
Edition 1990, 306 pages, bound

Order no. 018 347 (German)
Order no. 018 348 (English)

Siemens S7-300

Manual

The documentation package comprises the following manuals:
– Setup, CPU data
– Module data
– Operations list

Edition 1999

Order no. 184 557 (German)
Order no. 184 558 (English)
Order no. on request
(French, Spanish, Italian)

Preliminaire

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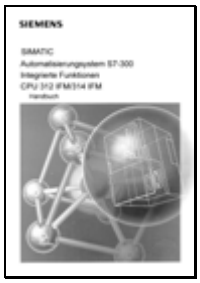
Integrated functions for Siemens-CPU 312 IFM/314 IFM



Manual

This manual describes the additional functions of the Siemens CPU 312IFM/314IFM.

Order no. 184 559 (German)
Order no. 184 560 (English)
Order no. on request
(French, Spanish, Italian)

Siemens documentation for S7/STEP 7 on CD-ROM

System requirements:
– PC with Win 95/98/2000/NT
– 4-speed CD-ROM drive

Manuals

The CD-ROM contains all manuals for:
– S7-200/300/400
– M7-300/400
– STEP 7 IL/LD/FUC/GRAPH/SCL
– SIMATIC-HMI/NET/DP

Edition 2000, CD-ROM

Order no. 192 883
(German, English, French, Spanish, Italian)

Siemens S5

Manual

Manual for the STEP5 Basic and minicontroller package V7 for 7xx/PC programmers.

Order no. 094 445 (German)
Order no. 094 446 (English)

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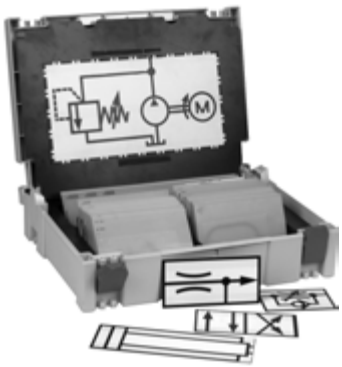
Courseware
Electronics/PLC

Magnetic circuit symbols



Additional accessories

Develop circuit diagrams step by step.

The symbols are stuck to a metal-based board. Connections and designations are marked with chalk. The sets are stored in a Systainer.

Magnetic symbol set Pneumatics/Hydraulics	Order no. 162 340
Magnetic symbol set Electrical engineering	Order no. 162 341

Drawing templates

Additional accessories

The drawing templates for control technology. Used to design pneumatic circuit diagrams or flow diagrams.

All electrical (DIN 40713), electronic (DIN 40719), pneumatic, hydraulic (DIN/ISO 1219) and logic symbols (DIN 40700) can be drawn.

Control technology template	Order no. 090 021
Program flowchart template	Order no. 090 022

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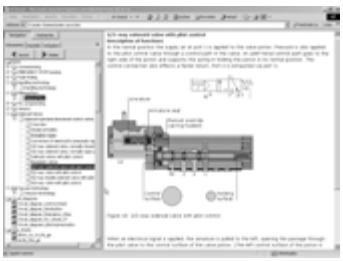
Mechatronics Assistant
Professional Training MPS®



System requirements:
– PC with Win 98/2000/ME/NT
– 128 MB RAM
– Internet Explorer 5.0 or higher

Training documentation MPS®

Order no. 529 133 (German)
Order no. 529 134 (English)

The Mechatronics Assistant is a tool for every purpose! The time previously lost researching, copying, collating, stapling and distributing is a thing of the past.

The new Mechatronics Assistant is a syllabus-oriented, structured archive on CD-ROM in which you can easily find the documentation for your classes – any time:
– Practice- and subject-oriented book of exercises with solutions, including for all MPS® stations
– Drawings, circuit diagrams and graphics
– Video sequences
– Presentations
– Technical documentation, operating instructions and safety notes
– Manuals and other aids

The Mechatronics Assistant is thus a multimedia tool for project work, training and examination preparation. A hypertext-based reference work for all areas related to automation training, and planning aid for training of mechatronics specialists and related specialties.

The Mechatronics Assistant Archive has several unique features that simplify your work:

Source formats
Many documents in Mechatronics Assistant are available in soruce format (e.g. DOC, DXF, PPT). This allows you to tailor the documents to your needs and update them as required.

Multidimensional database structure
All documents in the Mechatronics Assistant are structured on multiple levels:
– Training-oriented (toward the Mechatronics specialist syllabus)
– Subject-oriented (commissioning, troubleshooting, programming, installation)
– MPS® station-oriented
Whatever approach you use, you'll find what you're looking for.

Cross-referencing via hyperlinks
Additional information can be accessed via hyperlinks embedded in the text. Graphics – provided in source format – are also linked by keywords, allowing you to search for graphics by keyword.

A tool for teachers and trainees
Structure and handling are designed to allow trainees to work independently on an exercise using the Mechatronics Assistant. Here they find everything necessary for solution of the task. All solutions are available in a password-protected area.

Note function
User notes can be added to each text and document, making Mechatronics Assistant a personal tool on your desk and a "training aid" with its own character.

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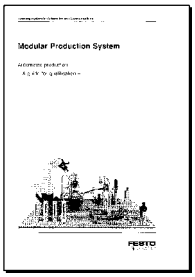
Courseware
Mechatronics/handling technology

Automated Production
A guideline to qualification



Training documentation MPS®

Interdisciplinary subjects from the areas of training methods and automation technology are covered in this training documentation. Real project management phases can be taught in training projects of varying degrees of complexity. The following areas are covered:
Training methods, planning and project planning, programming operation of systems, maintenance, including preventive maintenance, quality management, and visualization.

F. Ebel, S. Scharf, C. Löffler, E. v. Terzi
Edition 1996, 336 pages, in binder

Order no. 094 379 (German)
Order no. 094 386 (English)
Order no. 094 432 (Spanish)

The Festo Dictionary of Automation

System requirements:
– PC with Win 95/98/2000/NT
– At least Pentium II 133 MHz
– 32 MB RAM
– Approx. 26 MB free hard disk

Training documentation MPS®

The latest edition of the dictionary on CD-ROM contains some 18,000 terms in German, English, Spanish, French and Italian from the areas of automation technology (basics and products), organization and administration.

This is an indispensable aid to mechatronics specialist training.

Order no. 525 722
(German, English, Spanish, French, Italian)

Mechatronics

Training documentation MPS®

PLC technology, Industrial PCs or CNC controllers are now found on just about every shop floor. But communications systems are also established as a key element of modern industrial manufacturing facilities.
Mastering this development in process automation requires highly and diversely qualified specialists. Specialists who not only have qualifications in mechanical and electrical engineering and information technology, but are also in a position to learn independently and work in a team. The mechatronics training course trains such specialists.
Part A of the Mechatronics workbook contains the required general knowledge on project planning, material flow, the planning of automation systems, and the commissioning, maintenance and troubleshooting of complex systems. Part B covers the theoretical fundamentals in detail.
8 exercises with solutions are available to help the student put the material into practice. These exercises require stations from the MPS® program, Festo Didactic's Learning System for Mechatronics.

F. Ebel, E. v. Terzi
Edition 1999, 484 pages, in binder

Order no. 094 421 (German)
Order no. 094 536 (English)

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Mechatronics
"Sorting conveyor" module

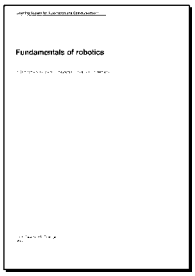
Training documentation

Order no. 095 243 (German)

This task is particularly suitable for covering basic skills and knowledge for the new "Mechatronics specialist" trade. It covers all course content for the first 18 months of training: manual working, machining, assembly, wiring, piping, commissioning, setting and testing (function, mechanical and electrical operational values).
Technical drawings, electrical and pneumatic circuits and sample production plans teach a systematic approach based on the principle "from simple to complex".
The finished task represents a simple mechatronic system that demonstrates the interplay of mechanical, electrical, electronic and information-technology elements.
Comprehensive material lists, practice-focused exercises and worksheets supplied on CD-ROM in Microsoft Word format facilitate preparation for the instructor. Also, the design as an open, activity-focused factory-type task gives instructors the possibility to expand on exercises and implement their own ideas. The demanding tasks meets all requirements stated in the syllabus guidelines for the intermediate exam, so it can also be used as a task for this exam.
The task requires the parts modules "Branch" and "Conveyor". The system is set up on a baseplate with pneumatic and electropneumatic parts which most training organizations will have as part of the "Electropneumatics" test.

H. Meixner, H. Müller
Edition 1999, 102 pages, with CD-ROM, in binder

Fundamentals of Robotics



Workbook

Order no. 081 062 (German)
Order no. 081 063 (English)
Order no. 094 355 (Spanish)

The workbook covers the fundamentals of robotics; knowledge that all who have to do with robots should possess.
The fundamentals section deals with the following topics Industrial robots in industrial production, The industrial robot itself, its characteristic values and its peripherals, robot drives, open- and closed-loop control systems of industrial robots, programming, and safety systems of industrial robots.
The exercises in this workbook are intended as an introduction to the MPS® handling station with robots, but they can of course be used together with any other robot station.

H. Dahlhoff, F. Götz, H. Hohenburg, R. Schulé, F. Spielmann
Edition 1993, 336 pages, in binder

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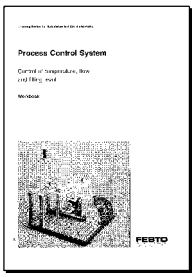
Process automation

Temperature, flow and level control
Process automation with the
Process Control System



Workbook

The workbook covers automation of continuous processes. The exercises teach students project planning and synthesis of control loops. A fundamentals section covers the material covered in the exercises in greater detail.
ProVis1 software is supplied with the workbook. This software package supports the training concept for the automation of continuous processes. It also provides visualization of the processes concerned. A complete measurement laboratory is available for completing and solving the exercises.
A Process Control station or system is required for practical implementation of the exercises. The ProVis1 software requires InTouch software to be installed on your computer.

H. Bischoff, D. Hofmann, E. v. Terzi
Edition 2000, 196 pages, with CD-ROM, in binder

Order no. 170 677 (German)
Order no. 171 149 (English)
Order no. 095 114 (Spanish)

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Writing folder

Additional accessories

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The perfect tool – not only for designing circuits.

Overhead projector
Geha top vision 2400

Additional accessories

This overhead projector has all the features normally only found in high-end equipment:
– Patented hinged column – for convenient transport
– Uniform illumination and impressive images in all classrooms and conference rooms
– Built-in lamp changer
– Simple handling

Lamp/service life	Low-voltage halogen lamp 36 V/400 W/50 h
Light intensity	Approx. 4000 Lumen
Economy setting	Approx. -10 %
Lens	3-element, f = 315 mm
Dimensions without column (W x D x H)	380 x 360 x 270 mm
Weight	12 kg

Mains connection 230 V AC (50 Hz)
suitable for DE, FR, NO, SE, FI, PT, ES, AT, NL, BE, GR, TR, IT, DK, IR, ID — Order no. 158 356

Mains connection 110 V AC (60 Hz)
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Point out what's important – a small but useful aid when working with the overhead projector.

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Order no. 090 094

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For the perfect presentation. Anodized aluminum, 65 x 12 mm, including battery.

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Data/video projectors

Additional accessories

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Poster

The history of automation in A0 format. Informative and entertaining.

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Order no. 094 362 (Spanish)
Order no. on request (Italian)

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Futurion®
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Futurion® – Learning with all your senses

A new training concept is taking automation electrical engineering and electronics training by storm:
Futurion® from Festo Didactic.

The important thing is to offer knowledge in a motivating way – and to ensure long-term retention. And for practical training to shape skills and cement experience.

Futurion® unifies "learning by doing" and "interactive learning" to a new learning system with a whole new dimension of functionality.

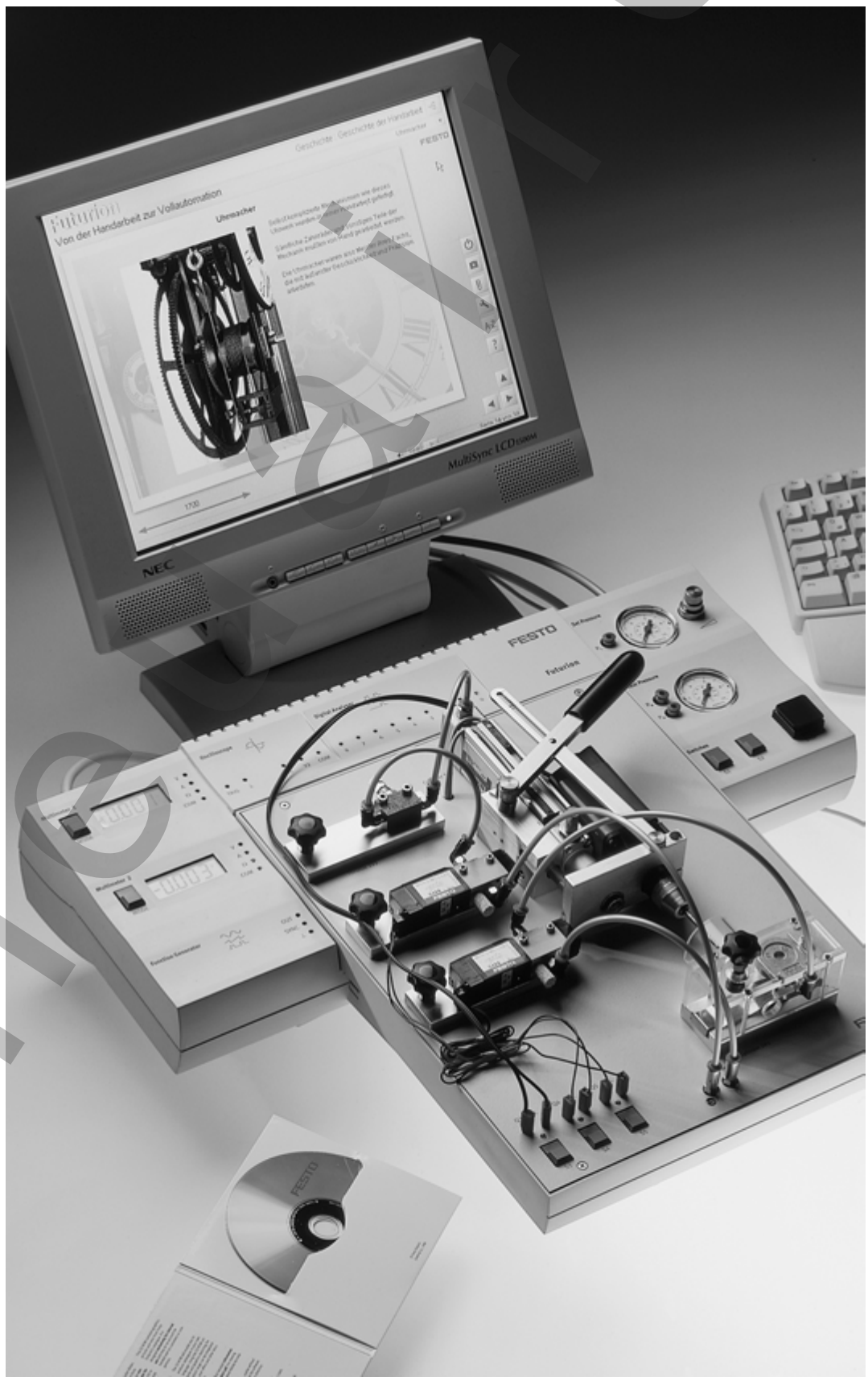
Trainees discover technology and the functions of real components through practical exercises. The learning program analyzes and corrects – or supplies approaches to finding the correct solution – quickly and objectively. Subject matter and exercises are selected according to an optimized didactic concept or are put together ad hoc by the trainer specifically to achieve a given training aim.

Those who wish can use all this information:
images, text, animations and videos.
Those who make great demands on their own creativity can start immediately with the exercises. Offline in course and information sections which are always available, or online in the Internet:
www.festo.com/didactic

Futurion® creates experience.

Futurion® turns 30 years of worldwide experience in vocational and continuing training into a concept:
Learning with all your senses.

Edutainment® on the basis of industrial requirements, for integration into conventional courses, or for self-learning.
Wherever and whenever you want.



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Futurion®
Training concept

Increased teaching efficiency

Customized training

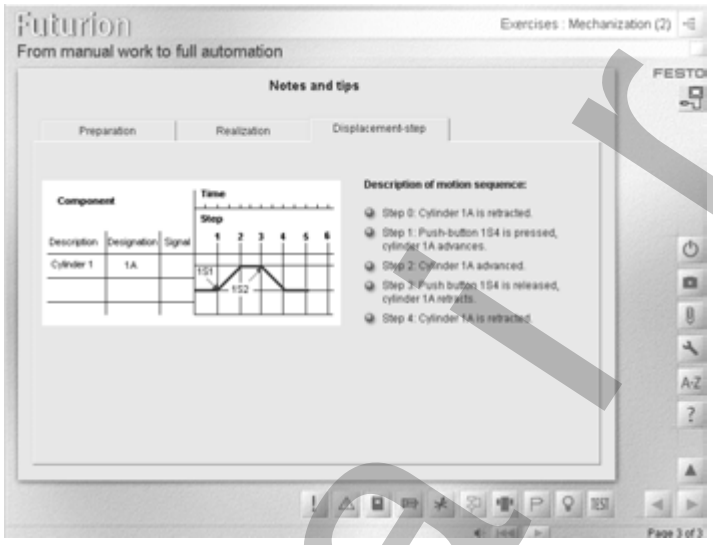
Futurion® courses from Festo Didactic offer a program-guided introduction to the selected subject. But only you – as teacher and trainer – know the individual strengths and weaknesses of your students and trainees. That is why the interactive learning programs allow you to set the sequences that your students and trainees are to work through. You decide the order and the aids – and in this way can challenge any individual as required.

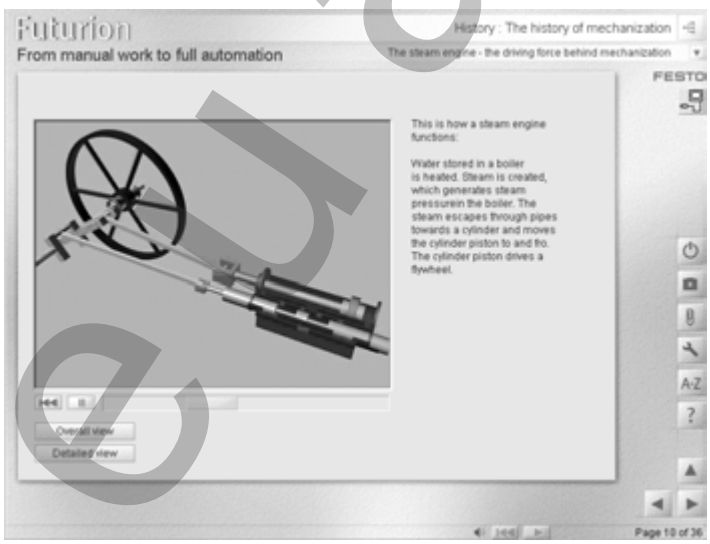
Greater training efficiency

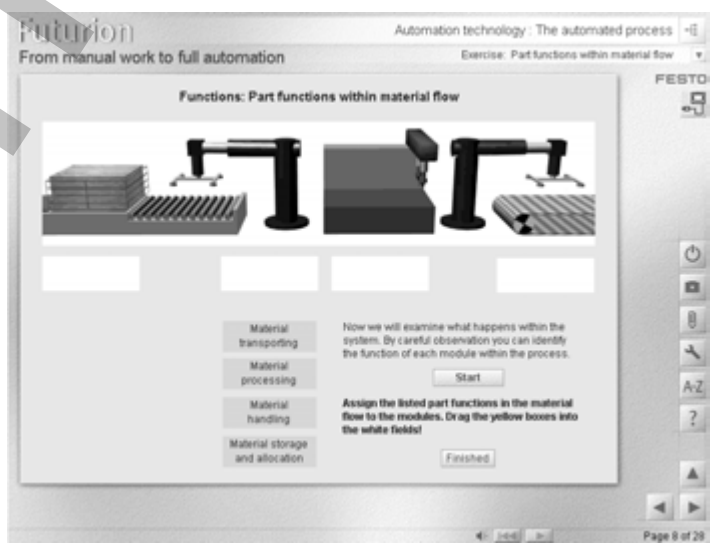
Futurion® is lab and classroom in one. Futurion® is your training aid for theory and practice. And your students and trainees develop the ability for self-learning. This gives you greater freedom for supplementary exercises, allows you to concentrate on particular students where required, and offer greater training quality in a shorter time

Sound investment

Further benefits of Futurion® are the time saved, system quality, and the renowned quality of Festo Didactic products with a 24-month guarantee. Your very first course will become a lucrative, future-safe investment.




Futurion
From manual work to full automation
History : The history of mechanization
The steam engine - the driving force behind mechanization
This is how a steam engine functions:
Overall view
Detailed view
Page 10 of 36



Increased learning efficiency

Never boring!

Find the solution to the exercise through trial and error, systematic approach or simulation. Learning with Futurion® can be an interesting journey through various learning worlds – and can be a lot of fun. Go at your own speed. How do you like to learn: fast, thoroughly, sporadically, intensively, slowly, exactly? Futurion®'s interactive learning programs let you train where you want and how you want. You yourself determine how you achieve your training aims.

Right? – Right!

The interactive learning program registers your solutions: not only correct answers, but also incorrect setups on the Learnboard. The program responds immediately – if necessary with a tip on how to find the solution. "Differentiated feedback" is a feature of outstanding interactive learning programs like the Futurion® courses from Festo Didactic.

Stay mobile!

Futurion® offers compact, self-contained learning units. Where ever you use your PC – hook up the Master Unit and off you go. Whether at home, at school, or at work.

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Futurion®
Equipment

The interactive desktop learning system

The Futurion® interactive desktop learning system comprises two function units:
– Master Unit
– Subject-oriented course with interactive learning program on CD and Learnboard

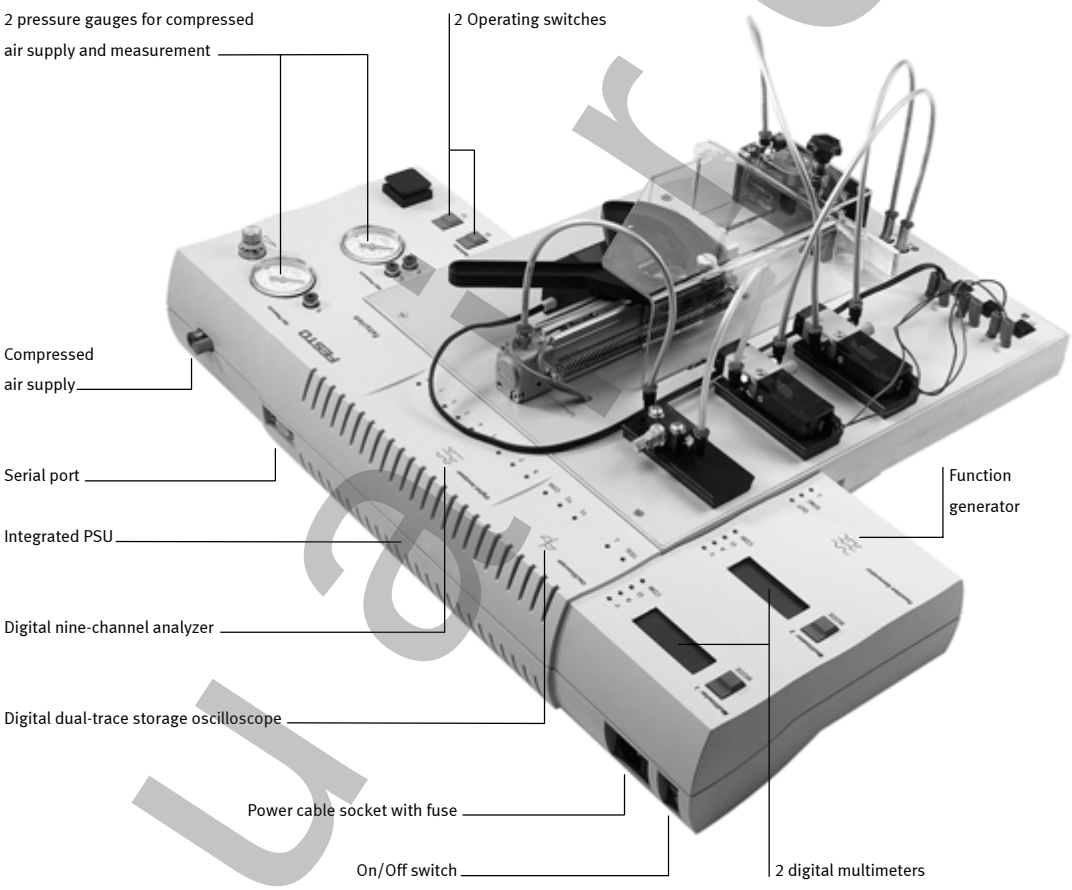
Master Unit

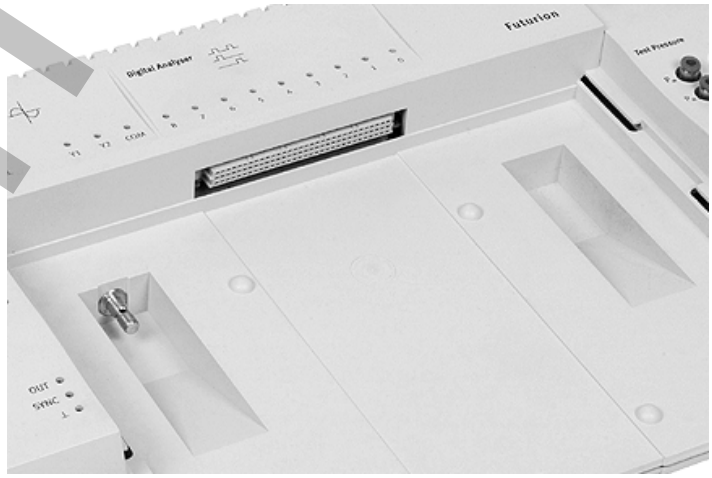
The Master Unit is the central unit of the learning environment to which the Learnboards for the various subjects are quickly and easily connected.

The Master Unit contains all measuring instruments required for the courses. The power supply unit is also integrated into the Master Unit.

All measuring instruments are displayed on the PC and operated there by mouse. You can also operate the two multimeters via real LC displays and pushbuttons.

Pressures are shown at the pressure gauges and on the PC. Compressed air supply for control of pneumatic functions of the Learnboard also takes place via the Master Unit.





The universal Interface

The interface between the Master Unit and the course Learnboard is where it all comes together for the desktop learning system.

It is via this multipin connector that the Master Unit receives information on the setup and passes it on to the PC for analysis.

This interface is compatible with all experiments on the market to date.

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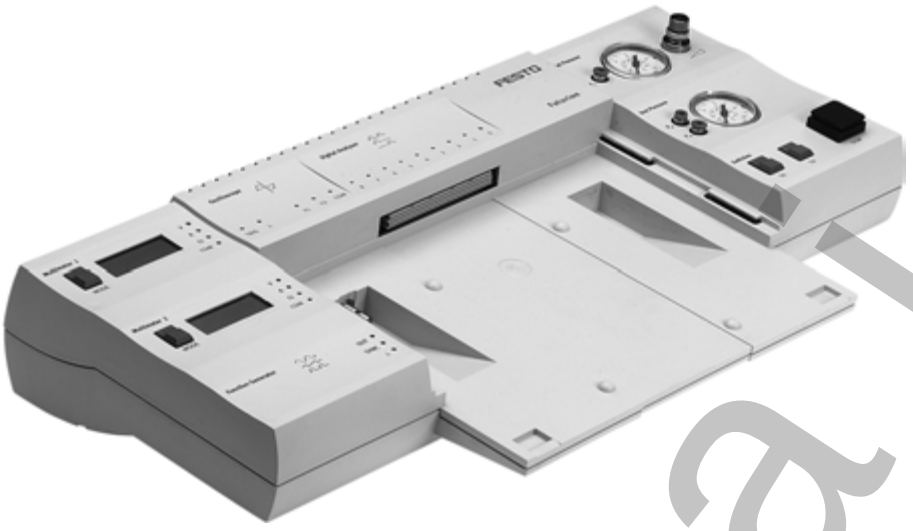
Master Unit



Please note the country-specific versions.

Recommended accessories for the courses
“Automation – from manual work to full automation”
and
”MecLab® 200“:
– Compressor
(for supplying compressed air to several Futurion® workplaces)
– Compressor
(for supplying compressed air to a single Futurion® workplace)
– Storage case
(Technical data and description in the Accessories chapter)

Country code (according to ISO)	Order no.
DE, FR, NO, SE, FI, PT, ES, AT, NL, BE, GR, TR, IT, DK, IR, ID	188 806
GB, IE, MY, SG, AE, HK	188 807
CH	188 808
US, CA, Central America, BR, CO, YU, EC, KR, TW, TH, PH	188 809
AU, NZ, CN, AR	188 810
ZA, IN, also in some cases for GB, PT, SG, AE, HK	188 811

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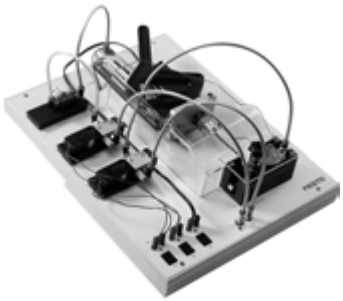
Futurion®
Courses

From manual work to full automation



Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/2000/ME/NT
– Pentium 100 MHz min
– 16 MB RAM
– Approx. 80 MB free hard disk, for full installation on hard disk approx. 500 MB
– Soundblaster-compatible sound card
– 12-speed CD-ROM drive
– Free serial port

digita 2000 Deutscher Bildungssoftware Preis

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Automation

Go on a journey of discovery!
This course takes you into a virtual learning environment the museum of automation technology. The museum brings history to life and shows how humankind and technologies have developed. In another room you learn the "inside story" of various industrial components, their function, and their significance for today's manufacturing process. Finally, things get really serious when you go into the lab and try to solve for yourself the problems presented to you, automating manufacturing processes.

Comprising:
– Learning program
– Learnboard
Course duration:
– Approx. 6 hours
Prerequisites:
– None

Learning the direct way!
If you know what you want, you can select training aims quickly via a classical menu structure:
– Introduction
– History
– Automation
– Technology and: work, society, future
– Practical exercise
Naturally, you can easily switch from one part of the course to another at any time.

It's the right feedback that counts!
Futurion® analyses your activity in the learning program and on the Learnboard. Operator error is just about impossible as the program constantly monitors conditions on the Learnboard (such as pressure and current). You can learn from your mistakes if you get the right feedback. And with Futurion, you do.

Learn what you want!
Very often, the possibility of adapting the course to various target groups is little more than an empty promise. But with this course it is no problem. As teacher or trainer you can:
– Select learning sequences by drag and drop
– Add new information pages or additional exercises – without any programming knowledge

Use all the tools!
The tools makes various tools available – the trainee can access these at any time. Together, the tools show all conceivable facets of the course subject matter:
– Design programs and simulation programs
– Reference works
– A guideline explains the system and its operation in detail
– Evaluation and statistics programs
– Solution aids and tips
– Navigation via search tree

Order no. 188 812 (German)
Order no. 188 813 (English)
Order no. 188 814 (French)
Order no. 188 815 (Spanish)
Order no. 525 723 (Dutch)
Other languages on request.

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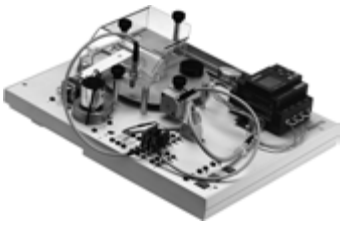
MecLab® 200



Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/2000/ME/NT
– Pentium 100 MHz min
– 16 MB RAM
– Approx. 80 MB free hard disk, for full installation on hard disk approx. 500 MB
– Soundblaster-compatible sound card
– 12-speed CD-ROM drive
– Free serial port

Mechatronics

This seminar focuses on the setup and commissioning of a single or multiple mechatronic subsystems using a digital minicontroller. Taken from everyday industrial practice, the project- and process-oriented tasks are designed for simulation on the Learnboard.
Safety and economic aspects are also taken into account. Planning, methodology, specialist and psychomotor skills are honed using various teaching materials. Tasks and their content are harmonized with the syllabus for mechatronics specialists.

Comprising:
– Learning program
– Learnboard including Siemens LOGO! controller, programming software and manual

Course duration:
– approx. 6 hours

Prerequisites:
– Fundamentals of electical engineering and digital technology

Training aims
– Describe the structure, function and applications of a digital minicontroller
– Be able to name the differences between the minicontroller and relay controllers and PLCs
– Implement simple control tasks with basic logic functions
– Use and program LOGO! as an example of a digital minicontroller
– Systematically solve simple control tasks from task definition and analysis to solution finding, programming, testing and documentation

In addition, a whole range of "soft skills" are also trained, such as:
– Structured planning, execution and documentation of tasks
– Awareness of means for accessing information
– Understanding and evaluating information in English
– Analyzing the economic application of logic controllers

Order no. 526 585 (German)
Order no. 526 588 (English)
Other languages on request.

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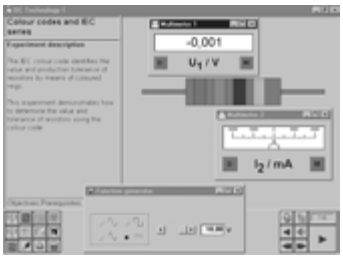
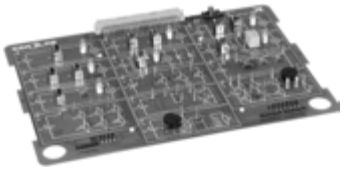
Futurion®
Courses

DC technology I and II

DC technology/AC technology



The courses DC technology I and II are entry-level courses in electrical engineering. Step by step, experiments and animations are used to illustrate basic terms and laws. DC I begins with the explanation of a circuit. The function of various basic circuits is described using theoretical and practical examples. DC II deals with the mode of operation of passive components. Participants very quickly learn the behavior of components by recording their characteristics for themselves.

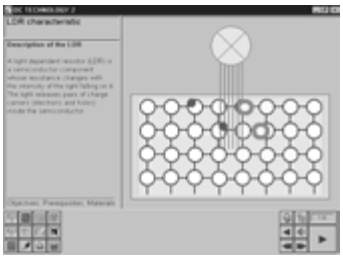


DC technology I

Order no. 167 226 (German, English)
Order no. 120 650 53 (Dutch)

Circuit with switch, switches in series, switches in parallel, changeover switch, pole changer, relay, conductivity, Ohm's law, Potential difference, Kirchhoff's Law, voltage divider, voltage divider under load, Wheatstone bridge.

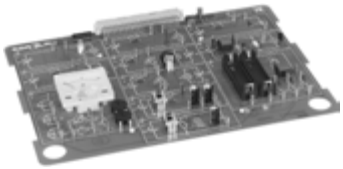
Comprising:
– Learning program
– Learnboard
Course duration:
– 4 x 45 Min
Prerequisites:
– None



DC technology II

Order no. 167 227 (German, English)
Order no. 120 650 54 (Dutch)

Incandescent lamp characteristic, VDR characteristic, diode characteristic, LDR characteristic, NTC characteristic, PTC characteristic, capacitor, capacitor in parallel, RC network, inductance, freewheeling diode, batteries.



Comprising:
– Learning program
– Learnboard
Course duration:
– 4 x 45 Min
Prerequisites:
– DC technology I

Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/NT
– Pentium 100 MHz min
– 16 MB RAM
– Soundblaster-compatible sound card
– 8-speed CD-ROM drive
– Free serial port

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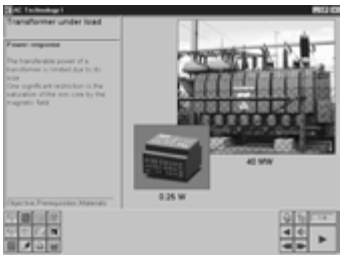
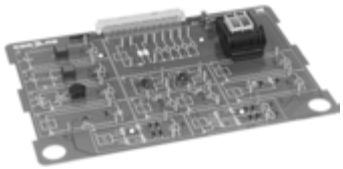
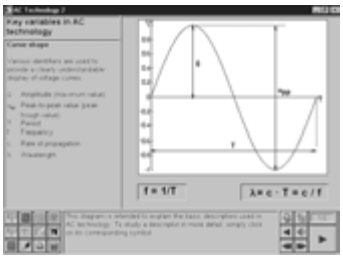
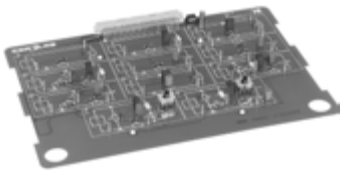
AC technology I and II

DC technology/AC technology









Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/NT
– Pentium 100 MHz min
– 16 MB RAM
– Soundblaster-compatible sound card
– 8-speed CD-ROM drive
– Free serial port

With practical examples and animations it's kids' play to learn how AC current and voltage behave. How AC voltage is generated – and how a transformer works (whether with or without load). This can be easily understood as the result of clear presentation. AC technology II covers the behavior of passive components in various different circuits. Coil, capacitor and resistor are examined and calculated in various combinations.

AC technology I

Order no. 167 228 (German, English)
Order no. 120 650 55 (Dutch)

Generation of pulse-shaped AC voltage,generation of continuous AC voltage, electronic generation of AC voltage, Inductance, principle of the transformer, short-circuited transformer, transformer under load, no-load loss of transformer, short-circuit losses of transformer, dynamic recording of the diode characteristic, M1 rectifier, M2 rectifier, B2 rectifier, symmetrical output voltage.

Comprising:
– Learning program
– Learnboard
Course duration:
– 3 x 45 Min
Prerequisites:
– DC technology

AC technology II

Order no. 167 229 (German, English)
Order no. 120 650 56 (Dutch)

Sinusoidal oscillation, parameters of AC voltage, Ohmic resistance in the AC circuit, coil in the AC circuit, inductive resistor, Series connection of R and L, parallel connection of R and L, capacitor in the AC circuit, capacitive resistor, series connection of R and C, parallel connection of R and C, series connection of R, L and C, parallel connection of R, L and C, serial compensation, parallel compensation.

Comprising:
– Learning program
– Learnboard
Course duration:
– 3 x 45 Min
Prerequisites:
– AC technology I

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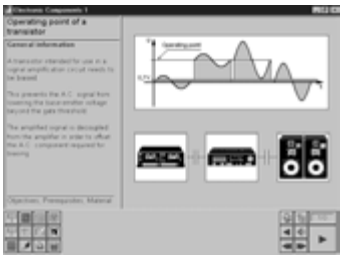
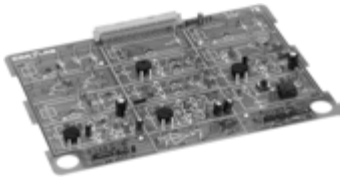
Electronic components I and II

Electronic components/operational amplifiers



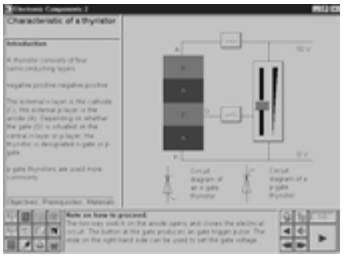
The diode was presented in DC technology II. In Electronic components I it is looked at from a whole different angle. The most important types are presented and their on-state and off-state characteristics are recorded and evaluated with a two-channel storage oscilloscope. The function of npn and pnp transistors is explained and circuits and characteristics examined. The Electronics components II uses special transistor types and semiconductors from the field of power electronics. One of the most important applications – phase control – is examined using the example of a thyristor and a triac.



Electronic components I Order no. 167 230 (German, English)

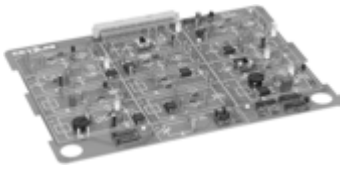
Characteristic of a photodiode, diode paths in the transistor, transistor characteristic, phototransistor characteristic, characteristic of a Darlington transistor, base-emitter circuit, basic transistor circuits, the transistor as a switch.

Comprising:
– Learning program
– Learnboard
Course duration:
– 4 x 45 Min
Prerequisites:
– Fundamental electrical engineering



Electronic components II Order no. 167 231 (German, English)

Diode characteristic, characteristic of a Zener diode, characteristic of a light-emitting diode, characteristic of the field-effect transistor, field-effect transistor as a switch , turn-off attenuation of the field effect transistor, structure and characteristics of the FET, FET as a switch, characteristic of the MOS-FET, MOS-FET as switch, characteristic of the IGBT, IGBT as switch, characteristic of the DIAC, Thyristor in DC mode, phase control with the thyristor, characteristic of the TRIAC, phase control with the TRIAC.



Comprising:
– Learning program
– Learnboard
Course duration:
– 4 x 45 Min
Prerequisites:
– Electronic components I

Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/NT
– Pentium 100 MHz min
– 16 MB RAM
– Soundblaster-compatible sound card
– 8-speed CD-ROM drive
– Free serial port

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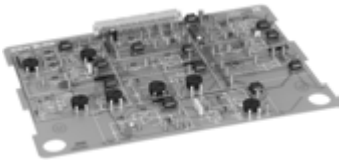
Operational amplifiers

Electronic components/operational amplifiers

Order no. 167 238 (German, English)



This course gives an introduction to the world of operational amplifiers. All important topics are covered – from the standard circuit to the implementation of a function generator. This course is an important basis for courses in closed-loop control.

Operational amplifiers
Comparator, properties of the operational amplifier, inverting operational amplifiers, non-inverting operational amplifiers, error simulation in inverting operational amplifiers, adders, integrators, differentiators, active filters, constant voltage sources, Schmitt triggers, astable multivibrator, Wien bridge oscillator, function generator.

Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/NT
– Pentium 100 MHz min
– 16 MB RAM
– Soundblaster-compatible sound card
– 8-speed CD-ROM drive
– Free serial port

Comprising:
– Learning program
– Learnboard

Course duration:
– 4 x 45 Min

Prerequisites:
– Electronic components

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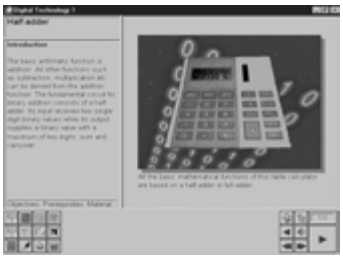
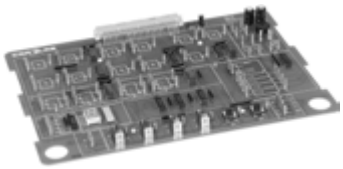
Courses

Digital technology I and II

Digital technology/microcomputer technology





Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/NT
– Pentium 100 MHz min
– 16 MB RAM
– Soundblaster-compatible sound card
– 8-speed CD-ROM drive
– Free serial port

The courses Digital technology I and II form the basis for the course microcomputers and telecommunications. Digital technology I covers uses logical associations to cover the fundamentals and laws of Boolean algebra. Digital technology II covers various flip-flop applications such as shift registers, parallel-to-series converters or serial data transmission. Both courses include extensive coverage of troubleshooting.

Digital technology I Order no. 167 232 (German, English)

TTL-AND, TTL-OR, TTL-EXOR, Logical association of binary inputs, DeMorgan's laws, associative law, distributive, coding, seven-segment display, KV diagram, half adder, full adder, multiplexer, demultiplexer (data transmission).

Comprising:
– Learning program
– Learnboard

Course duration:
– 4 x 45 Min

Prerequisites:
– DC technology

Digital technology II Order no. 167 233 (German, English)

RS flip-flop, Monostable and nonstable multivibrator, RS flip-flop with priorities, clocked RS flip-flop, clocked D flip-flop, master-slave flip-flop, JK flip-flop, binary circuit, incremental/decremental counter, BCD counter, synchronous counter, shift register, parallel-serial converter, serial data transmission, serial adder.

Comprising:
– Learning program
– Learnboard

Course duration:
– 4 x 45 Min

Prerequisites:
– Digital technology I

Special features:
– Note book: after each chapter the central themes are consolidated and can be printed out.

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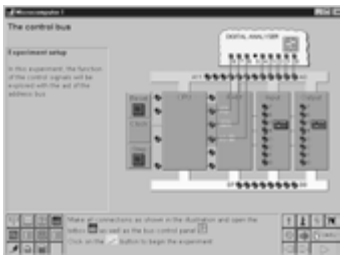
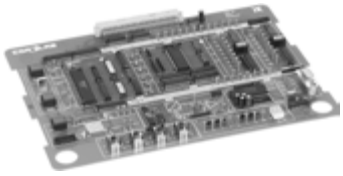
Microcomputer technology I and II

Digital technology/microcomputer technology





This course provides a firm background in hardware and software of the 8085 microcomputer. Knowledge and understanding gained in this course can be applied to all other types of processor. Microcomputer I covers the hardware of the computer in detail, with experiments and explanations of CPU, RAM, inputs and outputs. The 8085 microcomputer allows you to examine the various modules as independent function groups. Microcomputer II uses practical applications – such as a traffic-light control – to demonstrate various 8085 assembler programming techniques. This course forms the basis for studying higher programming languages. The course also introduces the most important peripheral components, such as the serial interface.

Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/NT
– Pentium 100 MHz min
– 16 MB RAM
– Soundblaster-compatible sound card
– 8-speed CD-ROM drive
– Free serial port

Microcomputer I

Order no. 167 234 (German, English)

Components and structure of the computer, addressing, control bus, bus coupling, input and output, memory, RAM and ROM, arithmetic operations, designing and writing programs, starting and testing programs, troubleshooting hardware and software, working with development tools.

Comprising:
– Learning program
– Learnboard

Course duration:
– 4 x 45 Min

Prerequisites:
– Digital technology

Microcomputer II

Order no. 526 584 (German, English)

Input – processing – output, loop, counting, cascading, delay, subroutines, table processing, reaction to an input, interrupt control, digital/analog conversion, binary weighing techniques, serial data transmission via RS 232.

Comprising:
– Learning program
– The Microcomputer II course uses the Learnboard from Microcomputer I.

Course duration:
– 4 x 45 Min

Prerequisites:
– Microcomputer I

Special features:
– Flexible use: The virtual laboratory and the modules can be used independently of the learning program, allowing own programs to be tested.
– Glossary: The glossary is a quick way to find definitions of the technical terms used in the two courses.
– Text editing: The integrated editor allows text, questions on content and glossary entries to be edited and expanded.

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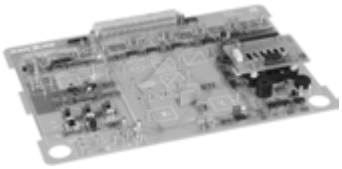
Courses

Closed-loop control I and II

Closed-loop control



These courses teach closed-loop control technology practically with many examples. Important training aims such as fuzzy control, Nyquist stability testing or controller optimization can be achieved without great effort and expense using controlled system, controllers and measuring equipment. Closed-loop control I focuses on introducing the different types of controller. Step by step, the course covers the analysis and calculation of controlled systems. Closed-loop control II covers complex closed-loop control systems and their behavior.

Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/NT
– Pentium 100 MHz min
– 16 MB RAM
– Soundblaster-compatible sound card
– 8-speed CD-ROM drive
– Free serial port

Closed-loop control I — Order no. 167 239 (German, English)

Open- and closed-loop control in everyday life, analysis of controlled systems, systems with and without compensation, higher-order controlled systems, PID and PI control, digital control, quality criteria for closed-loop control, setting rules for PID controllers, temperature control, rotary speed control, light control, control with discontinuous controllers, fault simulation.

Comprising:
– Learning program
– Learnboard

Course duration:
– 12 x 45 Min

Prerequisites:
– Operational amplifiers

Closed-loop control II — Order no. 193 817 (German, English)

Stability of closed-loop control systems, controller design according to Ziegler/Nichols method, systems with idle time, restrictions on manipulated variable, introduction to frequency response, frequency response of simple basic elements, frequency response of combined elements, controller design in frequency, fuzzy control, adaptive control, experiments with external controlled systems.

Comprising:
– Learning program
– The course Closed-loop control II uses the Learnboard from Closed-loop control I.

Course duration:
– 10 x 45 Min

Prerequisites:
– Closed-loop control I

Special features:
– Flexible use: The virtual laboratory and the modules can be used independently of the learning program for free experimentation.
– Glossary: The glossary is a quick way to find definitions of the technical terms used in the two courses.
– Text editing: The integrated editor allows text, questions on content and glossary entries to be edited and expanded.

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Power electronics I und II

(Not shown)

Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/NT
– Pentium 100 MHz min
– 16 MB RAM
– Soundblaster-compatible sound card
– 8-speed CD-ROM drive
– Free serial port

Power electronics

Power electronics has the taskof achieving maximum efficiency in the switching, controlling and transforming of electrical energy using power semiconductors. The course Power electronics I covers theory and practice, that is with experimentation in the application of uncontrolled and controlled rectifier circuits. Power electronics II covers AC conversion and frequency conversion in greater detail in connection with the three-phase four-quadrant drive. The course is rounded out by covering modern switched-mode power supply concepts.

Power electronics I

Order no. 167 235 (German, English)

Introduction, power electronics semiconductors, wiring and control, switching operations and commutation, uncontrolled rectifier circuits, characteristics of periodical signals, controlled line-communtated power converters, M1C circuit, M3C circuit, B2C circuit, B6C circuit, and partially controlled rectifiers.

Comprising:
– Learning program
– Learnboard
Course duration:
– 5 x 45 Min
Prerequisites:
– Electronic components

Power electronics II

Order no. in preparation (German, English)

Self-controlled power converters, semiconductor switches and setters, switches and setters for DC, converters, power converters and current regulators for closed-loop control technology.

Prerequisites:
– Power electronics I

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Futurion®
Courses

TX433 Transmitter technology
RX433 Receiver technology

(not shown)

Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/NT
– Pentium 100 MHz min
– 16 MB RAM
– Soundblaster-compatible sound card
– 8-speed CD-ROM drive
– Free serial port

Transmitter and receiver technology

The TX433 Transmitter technology course offers an unparalleled range of experiments as part of a comprehensive introduction to the concepts and operational characteristics of modern data and broadcast transmitters. The RX433 Receiver technology course teaches practiced-focused topics concerning modern radio receivers. It is the ideal supplement to our TX433 Transmitter technology seminar.

TX433 Transmitter technology Order no. 167 236 (German, English)

Spectrum analysis, network analysis, SWR measurement, matching and mismatching, amplitude modulation, single-sideband modulation, frequency modulation, ASK, FSK and PSK keying, structure of the transmitter oscillator, modulator and output stage, transmitter with 2-fold frequency conversion, tuning the transmission antenna through length adjustment, measuring the standing waves of transmission antennas, stereophonics, RDS signals, fault simulation.

Comprising:
– Learning program
– Learnboard
Course duration:
– 9 x 45 Min
Prerequisites:
– Fundamentals of electronics

RX433 Receiver technology Order no. 167 237 (German, English)

Receiver concepts, measuring technology, sound formation, radio receivers, RDS applications, service features and types of information, stereo reproduction, synchronous demodulation, envelope demodulation, how squelch works, the PLL, the Deem phase, encryption, data security, fault simulation.

Comprising:
– Learning program
– Learnboard
Course duration:
– 6 x 45 Min
Prerequisites:
– TX433 Transmitter technology

Special features:
– Flexible use: The virtual laboratory and the modules can be used independently of the learning program for free experimentation.
– Glossary: The glossary is a quick way to find definitions of the technical terms used in the two courses.
– Text editing: The integrated editor allows text, questions on content and glossary entries to be edited and expanded.

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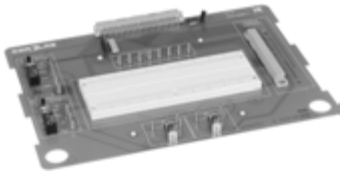
Protoboards I and II



Technical requirements:
– Futurion® Master Unit
– PC with Win 95/98/NT
– Pentium 100 MHz min
– 16 MB RAM
– Soundblaster-compatible sound card
– 8-speed CD-ROM drive
– Free serial port

Protoboards

The Protoboard turns your Futurion® into a development environment for electronic circuits. The Protoboard is simply connected to the Master Unit via the universal interface. When the Master Unit is switched on, all Master Unit fixed voltages and the function generator output are available via 2 mm sockets. The Master Unit multimeter and the function generator output can also be used without the PC. A breadboard with 1 mm contacts allows circuits to be setup with electronic components (not included in scope of delivery) and then tested using the measuring instruments integrated into the Master Unit and examined. The fixed voltage outputs and the function generator output are made available at 2 mm sockets and can be switched via software. The Protoboard has two selector switches for connection as desired.
In addition to the functionality mentioned above, Protoboard II allows the connection of standard Europa PC boards via a 64-pin VG terminal strip. 8 relays switch-over contacts are connected to the VG terminal strip. 8 digital outputs are accessible via the VG terminal strip and 2 mm sockets. Relays and digital outputs can be switched via software. Here, too, the power supply, multimeter and function generator of the master unit can be used without a PC.

Protoboard I Order no. 167 240 (German, English)
Comprising:
– Software for presentation of the integrated measuring devices (multimeter, function generator, storage oscilloscope, logic analyzer, frequency counter) under Windows
– 50 cable links 1 mm for wiring of components
– 20 adapter cables 1 mm/2 mm for connection from measuring points to measuring instrument inputs

Protoboard II Order no. 167 241 (German, English)
Comprising:
– Software for presentation of the integrated measuring devices (multimeter, function generator, storage oscilloscope, logic analyzer, frequency counter) under Windows
– 2 Europa hole-grid cards with VG connector for soldering exercises and for the setup of special circuits
– 50 cable links 1 mm for wiring of components
– 20 adapter cables 1 mm/2 mm for connection from measuring points to measuring instrument inputs
– 5 test probes with 2 mm connection sockets

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Futurion®
Accessories

Compressor Order no. 091 030

For compressed air supply for several Futurion® workplaces.

Pressure	Maximum 800 kPa (8 bar)
Free air delivery	50 l/min
Reservoir capacity	25 l
Noise level	40 dB (A) at 1 m
Electric motor	230 V/50 Hz; 0.34 kW

With mains cable, suitable for:
DE, FR, NO, SE, FI, PT, ES, AT, NL, BE, GR, TR, IT, DK, IR, ID

Accessories quick coupling socket, quick coupling plug, tubing Order no. 102 725

Compressor Order no. 167 248

Low-noise compressor for supplying compressed air to one Futurion® workplace.

Motor power	70 W
Working pressure	400 kPa (4 bar)
Duty cycle	40 %
Flow rate	20 l/min
Dimensions (L x W x H)	290 x 120 x 170 mm
Input voltage	230 V/50 Hz

Technical data as above, but: Order no. 167 249
Input voltage 240 V/50 Hz
(British version with British Standard plug.)

Technical data as above, but: Order no. 167 250
Input voltage 110 V/50 Hz

Storage case Order no. 167 271

For everyone who wants to use Futurion® on the move. The case accommodates one Master Unit and the Learnboard of your choice.

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TOMcase

The introduction to automation:

Mechatronics in a case

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TOMcase

The introduction to automation:

Mechatronics in a case

– Compact
– Mobile
– Application-oriented
– Time-saving

The overall system consists of three independent mechatronic subsystems that can either be operated independently or in combination. They teach the fundamentals of the technologies used as well as knowledge of material and information flow.

The subsystems are controlled by a Siemens "LOGO!" minicontroller in the case, which can be programmed without a PC via the control panel or with a PC and the "LOGO! Soft Comfort".

An open interface allow you to use your existing PLC for control.

The following training aims can be achieved using the appropriate Courseware:

– Fundamentals of electronics and digital engineering
– Fundamentals of pneumatics
– Fundamentals relay and PLC technology
– Reading and understanding circuit diagrams and displacement/step diagrams
– Fundamentals of sensors and actuators
– Fundamentals of material and information flow in a networked system
– Fundamentals of automation technology
– Fundamentals of mechatronics

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Magazine

Order no. 526 501

Magazine, electrical, with workpiece slide for material feed, sensors for differentiation of materials, conveyor with DC motor for material transport, and interface for communication with other TOMcases.
In aluminium case, complete with LOGO! controller.

Training aims:
– Material feed
– Material detection
– Material transport
– Communication

Case dimensions _____ 460 x 335 mm
Case height _____ 110 mm
Case height closed _____ 163 mm

Drilling

Order no. 526 502

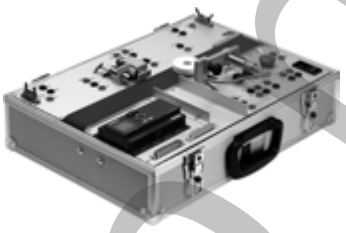
Drilling, pneumatic/electrical with sensors for material detection, valve manifold, drilling attachment for machining, conveyor with DC motor, for material transport, interface for communication with other TOMcases.
In aluminium case, complete with LOGO! controller.

Training aims:
– Material detection
– Material machining
– Material transport
– Communication

Case dimensions _____ 460 x 335 mm
Case height, open _____ 110 mm
Case height, closed _____ 163 mm

Quality

Order no. 526 503



Quality, electrical, with sensors for material detection and drill-hole checking, ejector for material sorting, conveyor with DC motor for material transport, interface for communication with other TOMcases.
In aluminium case, complete with LOGO! controller.

Training aims:
– Material detection
– Material testing
– Material sorting

Case dimensions _____ 460 x 335 mm
Case height, open _____ 110 mm
Case height, closed _____ 163 mm

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TOMcase

LOGO! PC cable	Cable for transmission of switching programs from a PC to a LOGO! and vice versa.	Order no. 526 504
LOGO! Soft Comfort System requirements for Windows 95/98/2000/ME/NT: – PC with Pentium Processor – 64 MB RAM – 90 MB free hard disk System requirements for Mac OS X and Linux: on request	Powerful programming software for the creation of LOGO! programs by Drag & Drop. Simulation and extensive program documentation.	Order no. 526 505 (German, English, French, Spanish, Italian, Portuguese)
LOGO! manual	Operating and programming instructions and example applications for the LOGO!	Order no. 526 506 (German) Order no. 526 507 (English)

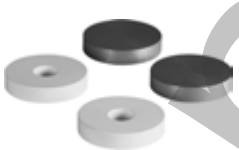
TOMcase workbooks

The workbooks consist of an instructor's book and a student's book.
The instructor's book contains information on the control variants, on commissioning, on fundaments of the functions implemented, on basic circuits with and without LOGO! and tasks for project work with and without LOGO! and I/O communication. The tasks have worked solutions.
The student's book has the same structure as the instructor's book, but the task sheets do not show the solutions.

Workbooks for TOMcase	German	English
Magazine	526 508	526 509
Drilling	526 510	526 511
Quality	526 512	526 513

Set of workpieces

Order no. 526 514



Consisting of 4 workpieces:
2 aluminium workpieces
2 white plastic workpieces

Diameter _____ 50 mm
Height _____ 10 mm

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Documents Provided by Coast Pneumatics
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Index
Alphabetical

Name of product	Page
2/2 way valves: see Valves	
2-way flow control valve with measuring connection, Transparent model, Hydraulics	65
3/2 way valves: see Valves	
3-way flow control valve, Transparent model, Hydraulics	67
4/2 way valves: see Valves	
5/2 way valves: see Valves	
99 practical examples Blue Digest on Automation	206
A	
A4 mounting frame: see Learnline, Economyline	
AC technology: see Futurion®	
Accessory box, Pneumatics	135
Accumulator filling device, Hydraulic	139
Accumulator, Sensors	95
Adapter for height adjustment, Sensors	91
Adapter, Y axis, Sensors	44
Air pressure reservoir, Pneumatics	41
Aluminium profile plate, Adapter, Sensors	94
Aluminium profile plates, Size 1100 x 700 mm	130
Aluminium profile plates, Size 350 x 1100 mm	14, 130, 174
Aluminium profile plates, Size 350 x 250 mm	41, 130
Aluminium profile plates, Size 550 x 700 mm	130
Aluminium profile plates, Size 700 x 350 mm	130
Aluminium profile plates, Size 700 x 700 mm	130
Aluminium profile plates, Rubber feet	130
Arm force sensor, Deflecting	98
Arrow pointer	233
AS-Interface: see MPS®	
Assembly profile	93
Axial piston motor, Transparent model, Hydraulics	67
Axle controller SPC 200/P01 with control unit, Pneumatics	47
Axle interface for position encoder, Pneumatics	49
B	
Back pressure valve, Pneumatics	33
Backpressure switch, Sensors	99
Basic pneumatic controllers, Practical knowledge Book	201
BIBB course: see Pneumatics, Electropneumatics, Hydraulics	
BIBB equipment set: see Equipment set	
Bladder accumulator, Transparent model, Hydraulics	68
Blue Digest on Automation	206
Branch tee, Hydraulics	72
Buffer battery	122
Bus Studio WBT, Fundamentals of fieldbus technology (DE)	185
Bus Studio WBT, Fundamentals of fieldbus technology (GB)	185
C	
Cable BNC 4 mm	133
Cable BNC, T-connector	133
Cable BNC-BNC	133
Cable set, universal	133
Cable, blue with 4 mm safety sockets	50, 133
Cable, red with 4 mm safety sockets	50, 133
Change management in production	206
Clamping with compressed air and vacuum, Blue Digest on Automation	206
Closed-loop control: see Process Control System, Futurion®	
Closed-loop control hydraulics: see Equipment set	
Closed-loop control hydraulics, Workbook	216
Closed-loop control pneumatics, Workbook	204
Closed-loop control pneumatics: see Equipment set	
Comparator, Pneumatics, Hydraulics	43, 81
Compressed air preparation and distribution	206
Compressor	131, 252
Compressor, Accessories	131, 252
Connection elements, Pneumatics	41
Connection unit, analog, Sensors, Electronics/PLC	97, 125
Connector: see Quick Star	
Connectors, Pneumatics	51
Control console: see MPS®, Process Control System	
Control panel: see MPS®	
COSIMIR® Educational	184
COSIMIR® Industrial	190
COSIMIR® Professional	189
COSIROP	190
COSIVIS	191
Counting unit, Sensors	98
Coupling nipple (nominal size 4), Hydraulic	138
Coupling socket (nominal size 4), Hydraulics	138
Courses Futurion®: see Futurion®	
CPU: see EduTrainer®	
Cushioning cylinder, Hydraulics	142
Cutaway model case Pneumatics, set 1	209
Cutaway model case Pneumatics, set 2	209
Cylinder 16/10/300, Assembly kit for (Order no. 184 489)	143
Cylinder 25/18/200, Assembly kit for (Order no. 184 490)	143
Cylinder, 16/10/200, Double-acting, Hydraulics	74
Cylinder, Assembly set, 16/10/200 (Order no. 152 857), Hydraulics	71
Cylinder, Double-acting 16/10/400, Hydraulics	143
Cylinder, Double-acting, 16/10/300, Hydraulics	142
Cylinder, Double-acting, 25/18/200, Hydraulics	142
Cylinder, Double-acting, Pneumatics, Electronics/PLC	38, 123
Cylinder, double-acting, Transparent model, Hydraulics	65
Cylinder, Sensors	95
Cylinder, Single-acting, Pneumatics, Electronics/PLC	38, 123
D	
Data cable RS232	125, 146
Data/video projectors	234
DC technology: see Futurion®	
Deflecting arm force sensor	98
Deflecting arm, Sensors	92
Design and simulation software: see FluidSIM®	
Diaphragm accumulator with shut-off block, Hydraulics	75
Diaphragm accumulator, Transparent model, Hydraulics	68
Dictionary: see The Festo Dictionary of Automation	
Diffuse reflective optical sensor, block-shaped, Sensors	101
Digital minicontrollers: see Futurion®	
Digital multimeter	132
Digital technology: see Futurion®	

preview

Documents Provided by Coast Pneumatics
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Index
Alphabetical

Name of product	Page
Display, Universal Hydraulics	144
Distance sensor, Analog, Ultrasound , Sensors	104
Distance sensor, Inductive, Analog, Sensors	105
Distribution unit, Sensors	97
Distributor plate 5-way, without pressure gauge, Hydraulics	139
Distributor plate, 5-fold, with pressure gauge, Hydraulics	139
Double nipple, Hydraulics	139
Double non-return valve, piloted, Transparent model, Hydraulics	66
Drawer units: see Learnline, Economyline	
Drawing template Control technology	131, 209, 219, 228
Drawing template Program flowchart	131, 209, 219, 228
Drip tray	141
Drip tray: see Drip tray	
Driving/tractive load, Pneumatics	38
Dual-pressure valve (AND), Pneumatics	34
Dual-pressure valve, 3-fold (AND), Pneumatics	37
E	
EasyPort D16 (Interface)	127, 147
EasyPort DA (Interface)	133
Economyline Cable guide	176
Economyline Drawer unit for stationary workstation	175
Economyline Drip tray	176
Economyline ER mounting frame	176
Economyline Extension set for horizontal profile plate	174
Economyline Holder for storage of hydraulic hoses	176
Economyline Hydraulic power unit: see Hydraulic power unit	
Economyline Mobile workstation with inclined profile plate mount for one-sided use	171
Economyline Mobile workstation with inclined profile plate mount for one-sided use with drip tray	171
Economyline Mobile workstation with inclined profile plate mount for two-sided use	172
Economyline Mobile workstation with inclined profile plate mount for two-sided use with drip tray	172
Economyline Mobile workstation with vertical profile plate mount for two-sided use	173
Economyline Mobile workstation with vertical profile plate mount for two-sided use with drip tray	173
Economyline Profile plate frame for inclined profile plate mount	174
Economyline Side unit left for vertical profile plate assembly	174
Economyline Side unit right for vertical profile plate assembly	175
Economyline Stationary workstation with inclined profile plate mount for one-sided use	170
Economyline Stationary workstation with inclined profile plate mount for one-sided use with drip tray	170
Economyline Table leg for stationary workstation	174
Economyline Tabletop for stationary workstation	174
Economyline Workstation substructure, both sides, for mobile workstation	175
Economyline Workstation substructure, one side, for mobile workstation	175
EduTrainer® FEC FST	116
EduTrainer® FEC MWT with Ethernet interface	116
EduTrainer® plus SIMATIC S7 ET 200M	115
EduTrainer® plus, Extensions for the SIMATIC S7	114

Name of product	Page
EduTrainer® S7 and EduTrainer® plus S7: Analog I/O group for S7-SM334-4E/2A	121
EduTrainer® S7 and EduTrainer® plus S7: Analog input group for S7-SM331-2AE	121
EduTrainer® S7 and EduTrainer® plus S7: Analog output group for S7-SM332-2AA	121
EduTrainer® S7 and EduTrainer® plus S7: Digital I/O group for S7-SM323-8E/8A	121
EduTrainer® S7 and EduTrainer® plus S7: Digital input group for S7-SM321-16E	121
EduTrainer® S7 and EduTrainer® plus S7: Digital output group for S7-SM322-16A	121
EduTrainer® S7 and EduTrainer® plus S7: Load power supply PS 307-1E	121
EduTrainer® S7 and EduTrainer® plus S7: Placeholder module	122
EduTrainer® S7and EduTrainer® plus S7: Load power supply PS 307-1B	121
EduTrainer® S7and EduTrainer® plus S7: SIMATIC-CPUs for S7-CPU312-IFM	121
EduTrainer® S7and EduTrainer® plus S7: SIMATIC-CPUs for S7-CPU313	121
EduTrainer® S7and EduTrainer® plus S7: SIMATIC-CPUs for S7-CPU314-IFM	121
EduTrainer® S7and EduTrainer® plus S7: SIMATIC-CPUs for S7-CPU314	121
EduTrainer® S7and EduTrainer® plus S7: SIMATIC-CPUs for S7-CPU315	121
EduTrainer® S7and EduTrainer® plus S7: SIMATIC-CPUs for S7-CPU315-DP	121
Electrohydraulics Equipment set: see equipment set	
Electrohydraulics, Advanced level Workbook	214
Electrohydraulics, Basic level Textbook	213
Electrohydraulics, Basic level Workbook	213
Electrohydraulics, Fundamentals, Set of tranparency	213
Electronic components: see Futurion®	
Electropneumatics BIBB course Fundamentals and application examples	204
Electropneumatics BIBB course Tasks, log sheets, exercise circuits	204
Electropneumatics equipment set: see Equipment set	
Electropneumatics, Advanced level Workbook	203
Electropneumatics, Basic level Textbook	202
Electropneumatics, Basic level Workbook	202
Electropneumatics/Electrohydraulics, Basic level Video	203, 214
EMERGENCY OFF function, Pneumatics	49
EMERGENCY OFF pushbutton, electrical, Pneumatics, Hydraulics	49, 86
End-position controller SPC 10, Pneumatics	46
Equipment set BIBB Electropneumatic	24
Equipment set BIBB Hydraulics for additional exercises	56
Equipment set BIBB Hydraulics, Exercises A – H	56
Equipment set BIBB Pneumatics	20
Equipment set Closed-loop control hydraulics, TP 511, complete	63
Equipment set Closed-loop control hydraulics, TP 511, general	63
Equipment set Closed-loop control hydraulics, TP 511, partial, control hydraulics, pressure control	63
Equipment set Closed-loop control hydraulics, TP 511, partial, position control	63
Equipment set Closed-loop pneumatics, Basic level TP 111	25
Equipment set Electrohydraulics, Advanced level TP 602	60
Equipment set Electrohydraulics, Basic level TP 601	59
Equipment set Hydraulics, Advanced level TP 502	55
Equipment set Hydraulics, Basic level TP 501	54
Equipment set Pneumatic positioning with the SPC 200 Axle controller	26
Equipment set Pneumatics, Advanced level TP 102	19

Preview

Documents Provided by Coast Pneumatics
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Index
Alphabetical

Name of product	Page
Equipment set Pneumatics, Basic level TP 101 Module 1: Single-acting cylinder and valves	17
Equipment set Pneumatics, Basic level TP 101 Module 2: Double-acting cylinders and valves	17
Equipment set Pneumatics, Basic level TP 101 Module 3: Advanced level with logic components	18
Equipment set Pneumatics, Basic level TP 101 Module 4: Supplement to complete TP 101	18
Equipment set Pneumatics, Basic level TP 101	16
Equipment set Pneumatics, Supplementary set from Pneumatics, Basic level TP 101 to Electropneumatics Basic level TP 201	21
Equipment set PneuPos 1, Partial equipment set Pneumatic positioning with a pneumatic NC axle	27
Equipment set PneuPos 2, Partial equipment set Supplementary equipment set for upgrade to two-axle system	27
Equipment set PneuPos 3, Partial equipment set Supplementary equipment set for pneumatic grippers for doing pick-and-place tasks	27
Equipment set PneuPos, Pneumatic positioning with the SPC 200 Axle controller	26
Equipment set Programmable logic controller, TP 301	118
Equipment set Proportional hydraulics, Advanced level TP 702	62
Equipment set Proportional hydraulics, Basic level TP 701	61
Equipment set Proximity sensors, FP 1110	88
Equipment set Sensors for distance and displacement, FP 1120	89
Equipment set Sensors for force and pressure, FP 1130	90
Equipment set SoftStop Supplementary equipment set single-axle system with SPC 10 extending to single-axle system with SPC 200 (PneuPos 1)	28
Equipment set SoftStop, Controlled end-position cushioning with SPC 10, Single-axle system	28
Equipment set supplementary from Electropneumatics basic level TP 201 to Electrohydraulics basic level TP 601 Supplementary equipment set 1	57
Equipment set supplementary from Electropneumatics basic level TP 201 to Electrohydraulics basic level TP 601 Supplementary equipment set 2	57
Equipment set supplementary from Electropneumatics basic level TP 201 to Electrohydraulics basic level TP 601 Supplementary equipment set 1 and 2	57
Equipment set supplementary from Hydraulics basic level TP 501 and advanced level TP 502 to Electrohydraulics basic level TP 601	58
Equipment set supplementary from Hydraulics basic level TP 501 to Electrohydraulics basic level TP 601	57
Equipment set, Advanced level TP 202	23
Equipment set, Basic level TP 201	22
Equipment set, Supplementary, Electropneumatics, basic level TP 201 to Programmable logic controller, TP 301	118
Equipment trays	130
ER mounting frame: see Learnline, Economyline	
F	
Fascination Pneumatics	205
Fast Soft Stop SPC 10 for drives type DGP(L) Manual	226
Fast Soft Stop SPC 10 Manual	226
FEC Programming cable with Converter TTL-RS232 for FEC-FC34 MWT, Electronics/PLC	129
FEC starter kit MWT with Ethernet interface	117
FEC-20DC FST Festo PLC	128
FEC-20DC FST Festo PLC, Interface cable	128
FEC-FC34 MWT Festo PLC	129
Fieldbus: see Bus Studio	
Flow control valve, 2-way, Hydraulics	73
Flow control valve, Hydraulics	72
Flow control valve, One-way, Hydraulics	72
Flow control valve, Transparent model, Hydraulics	64
Flow dividing valve, Hydraulics	75
Flow dividing valve, Transparent model, Hydraulics	66
Fluid Lab®-H	192
Fluid Studio® Hydraulics	183
Fluid Studio® Pneumatics	183
FluidSIM®3 Hydraulics	188
FluidSIM®3 Pneumatics	188
Foam insert, structured,for lid	134
Force sensor	99
FPC 101 Connection unit, analog, Electronics/PLC	97, 125
From manual work to full automation: see Futurion®	
FST Programming with Ladder diagram Manuals	226
FST Programming with Statement list Manuals	226
FST: see Programming software	
Function generator	133
Fundamentals of Electropneumatics Transparency set	203
Fundamentals of Hydraulics Set of transparency	210
Fundamentals of pneumatic control technology, Textbook	201
Fundamentals of Pneumatics Transparency set	200
Fundamentals of Proportional hydraulics Set of tranparency	215
Futurion® Compressor	252
Futurion® Compressor, Accessories	252
Futurion® Course AC technology I	243
Futurion® Course AC technology II	243
Futurion® Course Closed-loop control I	248
Futurion® Course Closed-loop control II	248
Futurion® Course DC technology I	242
Futurion® Course DC technology II	242
Futurion® Course Digital technology I	246
Futurion® Course Digital technology II	246
Futurion® Course Electronic components I	244
Futurion® Course Electronic components II	244
Futurion® Course From manual work to full automation	240
Futurion® Course MecLab® 200	241
Futurion® Course Microcomputer technology I	247
Futurion® Course Microcomputer technology II	247
Futurion® Course Operational amplifiers	245
Futurion® Course Power electronics I	249
Futurion® Course Power electronics II	249
Futurion® Course Protoboard I	251
Futurion® Course Protoboard II	251
Futurion® Course RX433 Receiver technology	250
Futurion® Course TX433 Transmitter technology	250
Futurion® Master Unit	239
Futurion® Storage case	252
G	
Gantry kit, Pneumatics	50
Gear motor, Sensors	93

preview

Documents Provided by Coast Pneumatics
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Index
Alphabetical

Name of product	Page
Gear motor, Transparent model, Hydraulics	67
Graph paper pad, mm grid, Sensors	92
Gripper technology dictionary Blue Digest on Automation	206
Gripper technology dictionary: see Dictionary	
Grippers and their applications Blue Digest on Automation	206
H	
Hand lever valve with closed mid-position, 4/3-way, Hydraulics	77
Hand lever valve with recirculating mid-position, 4/3-way, Hydraulics	77
Hand lever valve with relieving mid-position, 4/3-way, Hydraulics	77
Hand lever valve, 4/2-way, Hydraulics	76
Hand pointer	233
Holder for storage of hydraulic hoses	138
Hose line with quick-release coupling, Hydraulics	138
Hydraulic hoses, Holder for storage of	138
Hydraulic motor	74
Hydraulic Mounting adapter	140
Hydraulic oil (DIN 51524) HLP22 10 l	141
Hydraulic oil (DIN 51524) HLP22 20 l	141
Hydraulic oil (DIN 51524) HLP32 (suitable for Order no. 030 303)	141
Hydraulic power unit, Economyline mounting bracket for	141
Hydraulic power unit, Economyline mounting set	141, 176
Hydraulic power unit, Learnline mounting set	141, 176
Hydraulic power units	141, 176
Hydraulic power units: Funnel for filling oil into devices	141
Hydraulic Transparent models	64
Hydraulics BIBB course – Booklet for instructor	212
Hydraulics BIBB course – complete Workbook	212
Hydraulics BIBB course – Exercises and log sheets	212
Hydraulics BIBB course – Exercises for the students	212
Hydraulics BIBB course – Fundamentals and equipment, calculations and application examples	212
Hydraulics BIBB course - Transparencies for the series of exercises	212
Hydraulics Design and simulation software: see FluidSIM®	
Hydraulics measuring software: see Fluid Lab®-H	
Hydraulics Poster: see Poster	
Hydraulics self-study program (CBT, WBT): see Fluid Studio®	
Hydraulics, Advanced level Workbook	211
Hydraulics, Basic level Textbook	210
Hydraulics, Basic level Video	211
Hydraulics, Basic level Workbook	210
I	
I/O data cable with one SysLink connector as per IEEE 488 and bare cable end sleeves	127, 146
I/O data cable with SysLink connectors (IEEE 488) on both ends	146
I/O data cable with SysLink connectors (IEEE 488) on both ends, crossover, Electronics/PLC	127
I/O data cable, analog, Electronics/PLC	146
I/O data cable, Electronics/PLC	146
I/O extension, Pneumatics	51
Indicator unit and distributor, electrical, Pneumatics, Hydraulics, Electronics/PLC	42, 79, 125
Infrared light barrier, block-shaped, Sensors	101
Intermediate plate, Sensors	91
Internal gear motor, Transparent model, Hydraulics	67
InTouch	198
InTouch, Manual	198
L	
Laser pointer	233
Learnline A4 mounting frame	162
Learnline Basic mobile unit	160
Learnline Basic stationary unit, with integrated cable duct	160
Learnline Basic stationary unit, without integrated cable duct	160
Learnline Connecting elements for stationary workstations	168
Learnline Connecting elements for stationary workstations	168
Learnline Drip tray	164
Learnline ER mounting frame	162
Learnline Extension elements for stationary workstations	167
Learnline Extension elements for stationary workstations	167
Learnline Extension elements for stationary workstations	167
Learnline Inclination unit for profile plate	165
Learnline Mobile instructor's table	161
Learnline Mobile workstation, for one-sided use, hydraulic	158
Learnline Mobile workstation, for one-sided use, pneumatic	157
Learnline Mobile workstation, for two-sided use, hydraulic	158
Learnline Mobile workstation, for two-sided use, pneumatic	158
Learnline Mobile worktable	159
Learnline Mounting bracket for hydraulic power unit	164
Learnline Mounting for profile plate, 60° inclination	166
Learnline Mounting for profile plate, 85° inclination	166
Learnline Mounting for profile plate, vertical	165
Learnline Set of horizontal braces	165
Learnline Standing drawer unit for mobile workstations	163
Learnline Stationary workstation, with integrated cable duct	161
Learnline Stationary workstation, with integrated cable duct, hydraulic	157
Learnline Stationary workstation, with integrated cable duct, pneumatic	157
Learnline Stationary workstation, without integrated cable duct	161
Learnline Support plate for compressor	167
Learnline Suspended drawer unit for stationary workstations	162
Learnline Table extension left or right	166
Learnline Wheeled drawer unit	164
Limit switch, electrical, left-actuated, Pneumatics, Hydraulics	48, 86
Limit switch, electrical, right-actuated, Pneumatics, Hydraulics	48, 86
Linear drive, 200 mm stroke, Hydraulics	84
Linear drive, pneumatic with guide	51
Linear drive, pneumatic	39
Linear drive, pneumatic, with integrated position encoder, Pneumatics	50
Linear potentiometer, 200 mm stroke, Hydraulics	85
Linear potentiometer, 300 mm stroke, Hydraulics	143
Linear potentiometer, 300 mm stroke, Sensors	103
Linear potentiometer, 450 mm stroke, Hydraulics	143
LOGO!: see Futurion®, TOMcase	
M	
Magnetic symbol sets Electrical engineering	209, 219, 228
Magnetic symbol sets Pneumatics/Hydraulics	209, 219, 228
Maintenance and troubleshooting of installations with pneumatic controls Textbook	205

nieuwe

Documents Provided by Coast Pneumatics
ORDER ONLINE

ORDER ONLINE

Index
Alphabetical

Name of product	Page
Manifold, Pneumatics, Electronics/PLC	41, 124
Manufacturing Assembly Handbook Blue Digest on Automation	206
Master Unit: see Futurion®	
Measuring bridge amplifier, Sensors	97
Measuring case, Hydraulics	144
Measuring container for hydraulics	145
Measuring lead, Pneumatics	50, 133
Mechatronics "Sorting conveyor" module, Training documentation	231
Mechatronics and handling technology Automated Production Training documentation MPS®	230
Mechatronics Assistant	229
Mechatronics Training documentation MPS®	230
Mechatronics: see MPS®, TOMcase	
Memory Card Flash-EPROM, Electronics/PLC	122
Microcomputer technology: see Futurion®	
Modular insertion device, Blue Digest on Automation	206
Motor controller, Sensors	97
Mounting adapter for back pressure valve	136
Mounting adapter for double-acting cylinder	136
Mounting adapter for M18 sensors	136
Mounting adapter for pneumatic and electropneumatic roller lever valve	136
Mounting adapter for pneumatic linear drive unit	136
Mounting adapter for single-acting cylinder	136
Mounting adapter for solenoid valve	136
Mounting adapter, Hydraulics	140
Mounting frame: see Learnline, Economyline	
Mounting kit for hydraulic cylinder with weight, Hydraulics	177
Mounting kit for mounting the profile plate onto the plug-in board	14
Mounting kit for mounting the profile plate onto the plug-in board	14
Mounting profile, Hydraulics	140
MPS® Training documentation: see Mechatronics and Handling technology	
Multimeter: see Digital multimeter	
N	
Non-return valve 0.1 MPa/0.5 Mpa Opening pressure 1 bar	72
Non-return valve 0.1 MPa/0.5 Mpa Opening pressure 5 bar	72
Non-return valve, delockable, Hydraulics	74
Non-return valve, piloted, Transparent model, Hydraulics	65
Non-return valve, Transparent model, Hydraulics	65
O	
One-way flow control valve, Transparent model, Hydraulics	64
One-way light barrier, receiver, Sensors	101
One-way light barrier, transmitter, Sensors	100
Operational amplifiers: see Futurion®	
Optical analog distance sensor	98
Optical display (red), Pneumatics	40
Optical fiber for diffuse reflective optical sensor, Sensors	93
Optical fiber for one-way light barrier, Sensors	93
Orifice valve, Transparent model, Hydraulics	64
Oscilloscope	132
Overhead projector Geha top vision 2400	70, 233
P	
Parallel gripper module, complete, Pneumatics	51
PC adapter with RS232 cable	122, 147
PC data cable RS232 Female – Female	125
PC data cable RS232 Male – Female	125, 146
PC loading cable, Electronics/PLC	146
PID controller, Pneumatics, Hydraulics	43, 80
Plastic tubing cutter: see Tubing cutter	
Plastic tubing, Pneumatics	30, 95, 123, 134
Plastic tubing, unfastening tool, Pneumatics	135
PLC, Basic level Solution part Allen Bradley SLC500	222
PLC, Basic level Solution part Festo FPC 101	222
PLC, Basic level Solution part Festo FPC 101	222
PLC, Basic level Solution part Siemens S5-95U	222
PLC, Basic level Solution part Siemens S5-95U	222
PLC, Basic level Solution part Siemens S7-300 (IEC 1131-3)	222
PLC, Basic level Solution part Siemens S7-300 (IEC 1131-3)	222
PLC, Basic level Textbook	222
PLC, Basic level Transparency set	222
PLC, Basic level Video	223
PLC, Basic level Workbook	222
PLC: see Equipment set and EduTrainer®	
Plug-in adapter for ER units	136
Plug-in adapter	106, 131
Plug-in adapter, electrical, Electronics/PLC	147
Plug-in board adapter: see Universal adapter	
Pneumatic applications, Technical book	205
Pneumatic positioning system SPC 200 Manual	226
Pneumatic positioning Workbook	204
Pneumatic-electrical converter, Pneumatics, Sensors	47, 102
Pneumatics BIBB course Fundamentals and application examples	202
Pneumatics Design and simulation software: see FluidSIM®	
Pneumatics equipment set: see Equipment set	
Pneumatics Poster: see Poster	
Pneumatics self-study program (CBT, WBT): see Fluid Studio®	
Pneumatics, Advanced level Workbook	201
Pneumatics, Basic level Textbook	200
Pneumatics, Basic level Video	201
Pneumatics, Basic level Workbook	200
PneuPos: see Equipment set	
Position encoder	30, 51
Positioning slide, Sensors	92
Poster "The history of automation technology"	234
Poster Application examples for hydraulics	217
Poster Basic design of hydraulic circuits	218
Poster Directional control and non-return valves in hydraulics	217
Poster Electrical and electropneumatic components	208
Poster Electrical, pneumatic and logic symbols	207
Poster Flow control and pressure control valves in hydraulics	218
Poster Hydraulic power supply and cylinders	218
Poster Pneumatic directional, non-return and pressure valves	208
Poster Pneumatic working elements	208
Poster Pneumatics poster set	207
Poster set, Hydraulics	217
Poster Systematic circuit diagram of a pneumatic control system	207
Power electronics: see Futurion®	
Power supply unit for mounting frame	131

Preview

Documents Provided by Coast Pneumatics
ORDER ONLINE

ORDER ONLINE

Index
Alphabetical

Name of product	Page
Power supply unit for mounting frame	131
Power supply unit with set of hoses, Transparent model, Hydraulics	69
Power supply unit, tabletop	132
Preset counter, electrical, incrementing, Pneumatics, Hydraulics	44, 81
Preset counter, Pneumatic	35
Pressure balance (Proportional flow control valve), Hydraulics	78
Pressure filter Spare cartridge, Hydraulics	76
Pressure filter, Hydraulics	76
Pressure gauge , Transparent model, Hydraulics	68
Pressure gauge, Hydraulics	71
Pressure gauge, Pneumatics	32
Pressure manifold, Sensors	95
Pressure reducing valve, 3-way, Hydraulics	73
Pressure regulator valve with gauge, Pneumatics	40
Pressure regulator, Transparent model, Hydraulics	64
Pressure relief unit, Hydraulics	139
Pressure relief valve externally actuated, Transparent model, Hydraulics	66
Pressure relief valve, directly controlled, Transparent model, Hydraulics	64
Pressure relief valve, directly controlled, Transparent model, Hydraulics	64
Pressure relief valve, piloted, Hydraulics	73
Pressure relief valve, piloted, Transparent model, Hydraulics	66
Pressure relief valve, Pressure sequence valve, Hydraulics	73
Pressure sensor 1, Analog	105
Pressure sensor 2, Analog	106
Pressure sensor Connection parts nominal size 4 Hydraulics	144
Pressure sensor Connection parts nominal size 6 Hydraulics	144
Pressure sensor, analog, Pneumatics	46
Pressure sequence valve, Pneumatics	37
Pressure switch, Hydraulics	82
Pressure switch, Sensors	104
Pressure switch, Transparent model, Hydraulics	68
Pressure switch, Transparent model, Hydraulics	68
Process automation: see Temperature, Process Control System	
Process Control System Workbook: see Temperature	
Process Control: Temperature, flow and level control with the Process Control System, Workbook	232
Process simulation: see VEEP®2, COSIVIS	
Process visualization: see WinCC, InTouch	
Profibus cable	147
Profibus connection module IM153-1, Electronics/PLC	122
Profibus: see MPS®	
PROFIBUS-DP: Decentralization with PROFIBUS-DP Technical book	225
Profile plate: see Aluminium profile plate	
Programmable logic controllers in practice Textbook	223
Programming cable with Converter TTL-RS232 for FEC-FC34 MWT	129
Programming software FST for IPC/FEC	193
Programming software MULTIPROG wt for FEC-FC30/34	193
Programming software STEP 5	197
Programming software STEP 7 Trainer Package	196
Programming software STEP 7	194
Programming software STEP 7-GRAPH	195
Programming software STEP 7-Mini	194
Programming software STEP 7-SCL	195
Programming software WinPISA for SPC 200	192
Programming with Festo FST Ladder diagram Manuals	226
Programming with Festo FST Statement list Manuals	226
Proportional amplifier, Hydraulics	80
Proportional hydraulics, Advanced level Workbook	215
Proportional hydraulics, Basic level Textbook	214, 215
Proportional hydraulics: see Equipment set	
Proportional pressure relief valve, Hydraulics	84
Proportional valve, 4/3-way, Hydraulics	83
Proportional valve, 5/3-way, Pneumatics	46
Proportional valve, 5/3-way, Pneumatics	49
Protoboard: see Futurion®	
Proximity sensor, Inductive Type M12, Sensors	103
Proximity sensor, Inductive Type M18, Sensors	103
Proximity sensor, Non-contact inductive-magnetic, Sensors	99
Proximity sensor, non-contacting, inductive-magnetic, Sensors	106
Proximity sensor, Ultrasonic Type M18, Sensors	105
Proximity sensors Textbook	220
Proximity sensors Workbook	220
Proximity sensors: see Equipment set	
Proximity switch, capacitive, Pneumatics, Hydraulics, Electronics/PLC	48, 85, 129
Proximity switch, capacitive, Type M12, Sensors	104
Proximity switch, electronic with cylinder attachment, Pneumatics, Electronics/PLC	44, 126
Proximity switch, inductive, Pneumatics, Hydraulics, Electronics/PLC	47, 85, 128
Proximity switch, optical, Pneumatics, Hydraulics, Electronics/PLC	48, 86, 129
Proximity switch, Pneumatics	33
PS1 cookbook Blue Digest on Automation	206
push-pull connector: see Quick Star	
Q	
Quick Star quick push-pull connectors, Accessories: Silencer, M5, Pneumatics	135
Quick Star quick push-pull connectors, Accessories: Silencer, U 1/8, Pneumatics	135
Quick Star quick push-pull connectors, Accessories: Super seal, OL-1/8	135
Quick Star quick push-pull connectors, Accessories: Super seal, OL-M5	135
Quick Star quick push-pull connectors, Angle connector, rotatable, G1/8 (QSL-G1/8-4), Pneumatics	135
Quick Star quick push-pull connectors, Angle connector, rotatable, M5 (QSML-M5-4), Pneumatics	135
Quick Star quick push-pull connectors, Plug-in bulkhead connector (QSMS-4), Pneumatics	135
Quick Star quick push-pull connectors, Straight connector, G1/8 (QS-G1/8-4), Pneumatics	135
Quick Star quick push-pull connectors, Straight connector, M5 (QSM-M 5-4), Pneumatics	135
Quick Star quick push-pull connectors, Straight connector, self-closing, G1/8 (QSK-G1/8-4), Pneumatics	135
Quick Star quick push-pull connectors, Straight connector, self-closing, Pneumatics	135
Quick Star quick push-pull connectors, T connector (QST-4), Pneumatics	135
Quick-exhaust valve, Pneumatics	36
Quick-exhaust valve, Pneumatics, Sensors	36, 96

Documents Provided by Coast Pneumatics
ORDER ONLINE

ORDER ONLINE

Index
Alphabetical

Name of product	Page
R	
Rationalization of small parts feed, Blue Digest on Automation	206
Rationalization with Handling Technology Blue Digest on Automation	206
Receiver technology RX 433: see Futurion®	
Rectifier circuit, Transparent model, Hydraulics	67
Reed switch, Sensors	100
Reflector unit for reflective light barrier, Sensors	93
Reflectors, set of, Sensors	91
Regulating valve, 4/3-way, Hydraulics	84
Relay, three-fold, Pneumatics, Hydraulics	41, 78
Robot programming and simulation software: see COSIMIR®	
Robotics, Fundamentals, Workbook	231
Roller lever valve with idle return, 3/2-way , normally closed, Pneumatics	32
Roller lever valve, 3/2-way, normally closed, Pneumatics	32
Roller-lever valve, 3/2-way, normally open, Pneumatics	136
Rotary drive, Assembly set, Sensors	94
Rotary unit, Sensors	102
RS 232 cable: see Data cable	
Ruber feet for aluminium profile plate: see Aluminium profile plate	
Ruler, matching Linear drive, pneumatic with guide (Order no. 192 501)	51
Ruler, Pneumatics	52
Ruler, Sensors	92
S	
S5 documentation: see Siemens	
S5: see Edutrainer®, MPS®	
S7 EduTrainer® SIMATIC 313	111
S7 EduTrainer® SIMATIC 314	111
S7 EduTrainer® SIMATIC 315	111
S7 EduTrainer® SIMATIC 315-2DP	111
S7 EduTrainer® SIMATIC plus 312IFM 10I/6O digital	112, 113
S7 EduTrainer® SIMATIC plus 313 (without I/Os)	112
S7 EduTrainer® SIMATIC plus 314 (without I/Os)	112
S7 EduTrainer® SIMATIC plus 314IFM 20I/16O digital, 4I/1O analog	112, 113
S7 EduTrainer® SIMATIC plus 315 (without I/Os)	112
S7 EduTrainer® SIMATIC plus 315-2DP (without I/Os)	112
S7 EduTrainer® SIMATIC plus with CPU 312IFM with SysLink Steckbuchse	113
S7 EduTrainer® SIMATIC plus with CPU 314 and SysLink socket	113
S7 EduTrainer® SIMATIC plus with CPU 314	113
S7 EduTrainer® SIMATIC plus with CPU 314IFM with Measuring Module	113
S7 EduTrainer® SIMATIC plus with CPU 314IFM with Measuring Module and SysLink socket	113
S7 EduTrainer® SIMATIC plus with CPU 315-2DP with Measuring Module and SysLink socket	113
S7 EduTrainer® SIMATIC plus with CPU 315-2DP with SysLink socket	113
S7 EduTrainer® SIMATIC plus with CPU 315-2DP	113
S7 Handbook: see Siemens	
S7/STEP 7 Siemens Documentation on CD-ROM	198
S7: see Edutrainer®, MPS®	
S95: see Edutrainer®, MPS®	
Sensor applications in handling technology, Blue Digest on Automation	206
Sensor modules in automation Video	221
Sensor tester	148
Sensor, Optical Type M18	102
Sensor, Optical with optical-fiber-connector, block-shaped	100
Sensors for distance and displacement Workbook	220
Sensors for distance and displacement: see Equipment set	
Sensors for force and pressure Workbook	220
Sensors for force and pressure: see Equipment set	
Sensors Transparency set	221
Set of cables, complete, with 4 mm jack-plugs	50, 133
Set of cables, complete, with 4 mm safety plugs	50, 133
Set of sockets, Hydraulics	145
Set of workpiece: see MPS®, TOMcase	
Setpoint value card, Hydraulics	81
Shock absorber, Pneumatics	29, 51
Shut-off circuit, Transparent model, Hydraulics	66
Shut-off valve, Hydraulics	72
Shut-off/counterbalancing valve, Hydraulics	75
Shuttle valve (OR), Pneumatics	34
Shuttle valve, 3-fold (OR), Pneumatics	36
Siemens S5 Manual	227
Siemens S7/STEP 7 documentation Manuals	227
Siemens S7-300 Manual	226
Siemens-CPU: Integrated functions for Siemens-CPU 312 IFM/314 IFM Manual	227
Signal input, electrical, Pneumatics, Hydraulics, Electronics/PLC	42, 79, 124
Signal switching unit, Sensors	94
SIMATIC S7-300 Basic level Siemens course on CD-ROM	223
SIMATIC: Automation with SIMATIC Technical book	224
SIMATIC: see EduTrainer®, MPS®	
Simulation box (8I/8O) (SysLink)	184, 189
Simulation software: see FluidSIM®, COSIMIR®	
Slide rule Hydraulic	145, 219
Slotted mounting plate	130
Sockets, set of	135
SoftStop: see Equipment set	
Solenoid valve with closed mid-position, 4/3-way, Hydraulics	82
Solenoid valve with recirculating mid-position, 4/3-way, Hydraulics	83
Solenoid valve with relieving mid-position, 4/3-way, Hydraulics	83
Solenoid valve, 3/2-way solenoid valve with LED normally closed, Pneumatics	44
Solenoid valve, 4/2-way, double, Hydraulics	142
Solenoid valve, 4/3-way, Hydraulics	82
Solenoid valve, 5/2-way double solenoid valve with LED, Pneumatics, Electronics/PLC	45, 126
Solenoid valve, 5/2-way solenoid valve with LED, Pneumatics, Electronics/PLC	45, 126
Solenoid valve, 5/3-way solenoid valve with LED, neutral closed, Pneumatics	45
SPC 10 Handbook: see Fast Soft Stop	
SPC 10: see End-position controller	
SPC 10-PLC cable	52
SPC 200 Handbook: see Pneumatic positioning system	
SPC 200: see Axle controller	
Spindle drive unit, Sensors	92
Start-up valve with filter control valve, 5 µm, Pneumatics	52, 137
Start-up valve with filter control valve, Pneumatics, Sensors, Electronics/PLC	40, 96, 124
Status controller, Pneumatics, Hydraulics	43, 80

Preview

Documents Provided by Coast Pneumatics
ORDER ONLINE

ORDER ONLINE

Index
Alphabetical

Name of product	Page
Stem-actuated valve, 2/2-way, Hydraulics	78
STEP 5 Programming manual	197
STEP 5: see Programming software	
STEP 7: Automation with STEP 7 in IL and SCL Technical book	224
STEP 7: Automation with STEP 7 in LD and FUC Technical book	225
STEP 7: see Programming software	
STEP 7-Fundamentals, Documentation for Programming software	197
STEP 7-GRAPH Manual	197
STEP 7-Reference manual AWL, KOP, FUP	197
STEP 7-SCL Manual	197
Stepper module, Expansion, Pneumatics	37
Stepper module, Pneumatics	37
Storage case for Futurion®: see Futurion®	
Supplementary Equipment set: see equipment set	
Suspended drawer unit: see Learnline	
Swivel motor (linear), Transparent model, Hydraulics	67
Swivel motor (rotary vane), Transparent model, Hydraulics	67
Symbol set: see Magnetic	
SysLink coupling, Electronics/PLC	147
Systainer, Size 1	134
Systainer, Size 2	52, 134
Systainer, Size 3	134
Systainer, Size 4	134
Systematic circuit diagram of a pneumatic control system	207
T	
Table top power supply unit: see Power supply unit	
Temperature sensor Connection parts nominal size 4 Hydraulics	145
Temperature sensor Connection parts nominal size 6 Hydraulics	145
Test objects, set of, Sensors	91
The fascination of technology: From the hand wedge to the robot	182
The Festo Dictionary of Automation	182, 230
Time relay, two-fold, Hydraulics	42, 79
Time-delay valve, normally closed, Pneumatics	35
Time-delay valve, normally open, Pneumatics	35
TOMcase Drilling	255
TOMcase LOGO! Manual	256
TOMcase LOGO! PC cable	256
TOMcase Magazine	255
TOMcase Quality	255
TOMcase Set of workpieces	256
TOMcase Soft Comfort	256
TOMcase Workbook 1	256
TOMcase Workbook 2	256
TOMcase Workbook 3	256
Training documentation: see Mechatronics, MPS®	
Transmitter technology TX 433: see Futurion®	
Transparent model, Manual Hydraulics	69
Transparent model, Oil dye, Hydraulics	70
Transparent model, organizer, Hydraulics	70
Transparent model, Overhead projector Geha top vision 2400	70, 233
Transparent model, Plexiglass model support, Hydraulics	70
Transparent models (set) for basic level, Hydraulics	64
Transparent models Hydraulic	64
Tube adapter for externally calibrated tubes	14
Tube adapter for internally calibrated tubes	14
Tubing cutter, Pneumatics	134
Tubing: see Plastic tubing	
U	
Unfastening tool, Pneumatics	134
Universal adapter – Mounting adapter: see Mounting adapter	
Universal adapter, large	14, 136
Universal adapter, small	14, 136
Universal connection unit, digital (SysLink)	148
V	
Vacuum control, adjustable, Pneumatics	39
Vacuum nozzle/suction cup, Pneumatics	39
Valve, 2/2-way, Transparent model, Hydraulics	65
Valve, 3/2-way with mushroom-head emergency switch (red), normally closed, Pneumatics	32
Valve, 3/2-way with pushbutton actuator, normally closed, Pneumatics, Sensors	31, 96
Valve, 3/2-way with pushbutton actuator, normally open, Pneumatics	31
Valve, 3/2-way with selector switch, normally closed, Pneumatics	31
Valve, 3/2-way, pneumatically actuated, one side, convertible, Pneumatics	33
Valve, 4/2-way Transparent model, Hydraulics	65
Valve, 4/3-way,Transparent model, Hydraulics	65
Valve, 5/2-way double pilot valve, pneumatically actuated, both sides, Pneumatics	34
Valve, 5/2-way pilot-actuated, Transparent model, Hydraulics	66
Valve, 5/2-way with selector switch, Pneumatics	31
Valve, 5/2-way, pneumatically actuated, one side, Pneumatics	33
Valve, 5/3-way valve, pneumatically actuated, both sides, normally closed, Pneumatics	34
Vane motor, Transparent model, Hydraulics	67
VEEP®2	119
Vernier caliper mountable, Mounting set, Sensors	94
Vernier caliper, Mountable, Sensors	94
Vernier caliper, Sensors	145
Virtual process environment: see VEEP®2	
W	
Web Based Training: see Software	
Weight, adapter (Order no. 034 065), matching Linear drive, pneumatic with guide (Order no. 192 501)	51
Weight, Hydraulics	76, 140
Weight, Pneumatics, Hydraulics	29, 71
Weight, Protective cove, Hydraulics	140
Weights, Set of circular, Sensors	94
Weights, set of, Sensors	91
WinCC Configuration manuals	199
WINCC Documentation	199
WINCC	198
WinPISA: see Programming software	
Workstation systems: see Learnline, Economyline	
Writing folder	233

Preview

Documents Provided by Coast Pneumatics
ORDER ONLINE

ORDER ONLINE

Index
Numerical

Order no.	Page
002 307	135
004 499	14
004 645	135
007 658	134
011 717	64
011 718	64
011 719	64
011 720	65
011 721	64
011 722	64
011 723	66
011 724	64
011 725	65
011 726	65
011 727	65
011 728	65
011 729	65
011 730	65
011 731	65
011 735	70
011 738	64
013 394	66
013 395	66
013 396	66
013 397	66
013 398	67
013 399	67
013 400	67
013 401	67
013 402	66
013 403	67
013 404	67
013 405	67
013 406	67
013 407	68
013 408	68
013 409	68
013 410	68
013 411	68
014 572	141
014 613	146
018 347	226
018 348	226
018 351	226
018 352	226
019 500	91
019 505	91
030 303	69
030 332	133
032 195	145, 219
033 840	135
034 009	91
034 031	146
034 065	29, 71
034 070	91
034 083	91
034 085	92
034 094	92
034 572	29, 51
034 634	135
035 653	145
035 681	132
035 697	92
036 279	92
041 621	221
041 623	221
041 627	221
051 266	208
051 269	208
051 273	207
051 276	208
052 648	205
052 656	205
052 660	205
052 729	217
052 730	217
052 731	218
052 732	218
052 733	218
052 868	206
052 912	206
052 913	206
053 032	217
053 033	217
053 034	218
053 035	218
053 036	218
053 202	206
053 214	206
053 312	206
053 435	206
053 468	207
053 469	207
053 470	207
053 471	208
053 472	208
053 473	208
053 474	217
053 475	217
053 476	217
053 477	217
053 478	218
053 479	218
053 480	218
053 481	218
053 482	218
053 483	218
053 580	206
053 583	206
053 584	206
053 585	206
053 610	207
053 611	207
053 612	208
053 613	208
053 614	207
053 615	207
053 616	208
053 617	208
053 618	208
053 619	208
053 626	206
053 627	206
053 713	206
053 714	206
053 715	206
053 752	206
053 753	206
053 754	206
053 787	206
053 788	206
053 789	206
053 790	206
053 791	206
053 792	206
053 793	206
053 794	206
053 977	205
054 119	206
080 147	56
080 148	56
080 220	69
080 230	69
080 231	69
080 235	69
080 236	69
080 240	16
080 241	19
080 242	20
080 246	54
080 247	55
080 824	92
080 828	93
081 062	231
081 063	231
090 002	233
090 021	131, 209, 219, 228
090 022	131, 209, 219, 228
090 070	202
090 090	202
090 094	233
090 155	220
090 156	220
090 165	220
090 166	220
090 841	205
090 850	201
090 851	201
090 857	201
090 872	202
090 877	202
091 030	131, 252
091 070	63
091 180	202
091 181	202
091 590	223
092 190	212
092 271	222
092 491	139
093 024	212
093 045	220
093 046	220
093 070	204
093 080	204
093 130	200
093 131	200
093 132	200
093 137	200
093 175	205
093 280	210
093 281	210
093 282	210
093 287	210
093 310	222
093 311	222
093 313	222
093 314	222
093 315	222
093 316	222
093 317	222
093 332	222
093 333	222
093 610	213
093 611	213
093 680	212
093 685	212
093 690	212
093 960	221
094 000	200
094 001	200
094 002	201
094 003	201
094 014	211
094 015	211
094 330	220
094 331	220
094 335	201
094 337	204
094 342	220
094 347	204

preuaire

Documents Provided by Coast Pneumatics
ORDER ONLINE

ORDER ONLINE

Index
Numerical

Order no.	Page
094 348	216
094 351	213
094 352	215
094 355	231
094 360	201
094 361	211
094 362	234
094 364	213
094 368	216
094 377	214
094 378	214
094 379	230
094 384	200
094 386	230
094 404	215
094 421	230
094 427	222
094 428	210
094 429	211
094 432	230
094 437	69
094 438	69
094 440	222
094 445	227
094 446	227
094 447	197
094 448	197
094 449	197
094 450	215
094 451	203, 214
094 452	202
094 453	203
094 454	210
094 455	213
094 456	214
094 457	215
094 458	215
094 459	204
094 460	216
094 465	204
094 466	202
094 467	203
094 468	210
094 469	216
094 470	213
094 471	214
094 472	215
094 473	215
094 524	222
094 536	230
094 537	222
094 558	212
095 000	200
095 001	200
095 003	200
095 010	203
095 011	203
095 021	222
095 040	210
095 041	210
095 042	210
095 043	210
095 050	213
095 051	213
095 060	215
095 061	215
095 100	201
095 101	201
095 110	203, 214
095 111	203, 214
095 114	232
095 121	223
095 140	211
095 141	211
095 241	198
095 242	198
095 243	231
095 246	203
102 725	131, 252
107 635	93
109 383	93
110 672	70
115 608	93
115 615	93
115 616	93
119 352	140
120 778	71
120 835	174
120 837	174
130 500	233
150 504	93
150 505	93
150 506	93
150 519	94
150 536	94
150 538	94
150 539	94
150 540	94
150 543	94
150 555	95
150 557	95
150 578	95
151 496	30, 95, 123, 134
151 508	201
152 295	142
152 628	30, 51
152 841	71
152 842	72
152 843	72
152 844	72
152 845	72
152 846	72
152 847	72
152 848	73
152 849	73
152 850	73
152 851	73
152 852	74
152 857	74
152 858	74
152 859	75
152 860	31, 96
152 861	31
152 862	31
152 863	31
152 864	32
152 865	32
152 866	32
152 867	32
152 868	33
152 870	33
152 871	33
152 872	33
152 873	34
152 874	34
152 875	34
152 876	34
152 877	35
152 878	35
152 879	35
152 880	36
152 881	36, 96
152 882	36
152 883	37
152 884	37
152 885	37
152 886	37
152 887	38, 123
152 888	38, 123
152 889	38
152 890	39
152 891	39
152 892	39
152 893	40
152 894	40, 96, 124
152 895	40
152 896	41, 124
152 898	41
152 912	41
152 917	132
152 918	133
152 919	133
152 941	161
152 943	161
152 948	162
152 949	162
152 956	160
152 957	160
152 960	138
152 962	141, 176
152 963	30, 134
152 967	75
152 968	75
152 969	76
152 970	138
152 971	139
152 972	76, 140
152 973	140
152 974	76
152 975	77
152 976	77
152 977	77
152 978	78
153 128	135
153 291	135
153 304	135
153 327	14
153 333	135
153 376	135
158 268	160
158 272	164
158 273	164
158 278	162
158 279	162
158 280	162
158 281	162
158 284	163
158 285	163
158 286	163
158 287	163
158 305	234
158 315	159
158 323	166
158 324	167
158 325	141
158 325	164
158 326	165
158 327	166
158 328	166
158 329	165
158 331	161
158 332	165
158 343	130
158 352	138
158 356	70, 233
158 357	133
158 419	135
158 481	148
159 298	133
159 328	141, 176

preuaire

Documents Provided by Coast Pneumatics
ORDER ONLINE

ORDER ONLINE

Index
Numerical

Order no.	Page
159 329	70
159 330	70
159 331	130
159 333	41, 130
159 339	136
159 340	136
159 342	136
159 347	136
159 350	136
159 351	78
159 360	136
159 378	136
159 382	131
159 386	138
159 395	139
159 396	131
159 409	130
159 410	130
159 411	130
159 412	138
159 412	138
159 412	176
159 662	30, 95, 123, 134
159 663	30, 95, 123, 134
160 786	125
162 220	172
162 221	172
162 224	174
162 225	141, 176
162 226	176
162 231	148
162 241	41, 78
162 242	42, 79, 124
162 243	42, 79
162 244	42, 79, 125
162 247	97, 125
162 248	97
162 249	97
162 250	97
162 252	98
162 253	43, 80
162 254	43, 80
162 255	80
162 256	81
162 257	43, 81
162 267	136
162 268	121
162 305	125, 146
162 340	209, 219, 228
162 341	209, 219, 228
162 342	209
162 343	209
162 344	145
162 355	44, 81
162 356	170
162 357	170
162 358	171
162 359	171
162 360	14, 130, 174
162 380	132
162 381	132
162 382	132
162 384	175
162 386	130
162 409	175
162 410	175
162 411	131
162 412	131
162 413	131
162 414	131
162 415	131
162 416	132
162 417	132
162 418	132
162 419	132
167 020	135
167 032	44
167 051	98
167 052	98
167 053	99
167 054	99
167 055	99
167 056	100
167 060	44, 126
167 064	100
167 065	100
167 066	101
167 067	101
167 068	101
167 073	44
167 074	45, 126
167 076	45, 126
167 077	45
167 078	46
167 080	82
167 082	82
167 083	82
167 084	83
167 085	83
167 086	83
167 087	84
167 088	84
167 089	84
167 090	85
167 091	133
167 094	46
167 097	102
167 099	21
167 101	118
167 102	118
167 103	57
167 104	57
167 105	58
167 106	127
167 114	183
167 117	183
167 120	119
167 120	119
167 121	127, 147
167 122	127, 146
167 124	119
167 132	116
167 136	111
167 137	112
167 138	112, 113
167 139	112
167 140	112
167 141	112
167 142	114
167 143	114
167 144	114
167 145	114
167 146	114
167 147	114
167 148	114
167 149	114
167 150	115
167 151	114
167 152	114
167 153	121
167 154	121
167 155	121
167 156	122
167 157	111
167 158	191
167 159	191
167 160	191
167 161	191
167 162	119
167 163	119
167 164	119
167 165	119
167 166	102
167 173	112, 113
167 174	114
167 175	122
167 183	111
167 184	111
167 186	140
167 193	191
167 195	119
167 197	146
167 209	191
167 210	191
167 211	119
167 212	119
167 213	113
167 214	113
167 215	113
167 216	113
167 217	113
167 218	113
167 219	113
167 220	113
167 222	173
167 223	173
167 225	114
167 226	242
167 227	242
167 228	243
167 229	243
167 230	244
167 231	244
167 232	246
167 233	246
167 234	247
167 235	249
167 236	250
167 237	250
167 238	245
167 239	248
167 240	251
167 241	251
167 248	252
167 249	252
167 250	252
167 271	252
167 272	157
167 273	157
167 274	157
167 275	158
167 276	158
167 277	158
170 095	192
170 097	192
170 228	49
170 231	49
170 245	226
170 246	226
170 360	46
170 469	176
170 521	47
170 643	148
170 677	232
171 149	232
177 428	128
177 431	128
177 459	47, 102
177 464	103
177 465	103

preuaire

Documents Provided by Coast Pneumatics
ORDER ONLINE

ORDER ONLINE

Index

Numerical

Order no.	Page
177 466	103
177 468	144
177 469	104
177 470	104
177 471	104
178 410	30, 95, 123, 134
178 417	30, 95, 123, 134
178 424	30, 95, 123, 134
178 574	47, 85, 128
178 575	48, 85, 129
178 577	48, 86, 129
183 322	48, 86
183 345	48, 86
183 347	49, 86
183 737	144
184 117	105
184 118	105
184 128	105
184 129	106
184 130	106
184 455	139
184 460	22
184 461	23
184 462	24
184 463	59
184 464	60
184 465	61
184 466	62
184 467	25
184 471	63
184 472	63
184 473	63
184 474	88
184 475	89
184 476	90
184 488	143
184 489	142
184 490	142
184 523	191
184 524	191
184 525	183
184 528	183
184 547	121
184 548	121
184 549	121
184 550	121
184 551	121
184 555	122, 147
184 556	122
184 557	226
184 558	226
184 559	227
184 560	227
184 561	194
184 562	194
184 563	197
184 564	197
184 565	197
184 566	197
184 802	121
184 803	121
184 804	121
185 422	122
185 471	193
185 472	193
185 692	147
185 979	121
186 085	141
186 087	141
186 095	135
186 116	135
186 294	135
187 950	121
188 806	239
188 807	239
188 808	239
188 809	239
188 810	239
188 811	239
188 812	240
188 813	240
188 814	240
188 815	240
188 935	129
189 530	193
189 551	146
191 448	129
192 108	198
192 168	220
192 198	17
192 199	17
192 200	18
192 201	18
192 215	141
192 262	203
192 490	27
192 493	49
192 494	49
192 495	49
192 496	27
192 497	50
192 498	49
192 500	50
192 501	51
192 502	27
192 503	204
192 778	117
192 883	198, 227
192 943	226
192 944	226
192 949	226
192 950	226
193 082	188
193 129	207
193 130	197
193 131	197
193 132	197
193 133	197
193 449	223
193 730	116
193 754	188
193 756	188
193 758	188
193 760	188
193 805	119
193 809	119
193 810	119
193 811	119
193 812	119
193 813	119
193 814	119
193 815	119
193 816	119
193 817	248
193 930	133
193 977	141
194 022	190
194 023	184
194 025	184
194 026	189
194 027	189
194 028	190
194 030	184
194 031	184
194 032	184
194 033	184
194 034	182
194 035	182
194 036	182
194 037	182
194 039	224
194 040	224
194 041	225
194 042	223
194 043	225
195 224	14, 136
195 225	14, 136
195 439	198
195 440	199
195 441	199
195 442	198
195 897	28
196 075	28
196 532	184, 189
196 943	167
196 944	167
196 945	167
196 946	168
196 947	168
196 948	217
196 949	204
196 952	202
196 953	213
196 954	214
196 978	145
196 979	144
197 084	188
197 088	188
197 090	188
197 118	30, 134
197 526	190
197 530	200
226 400	133
226 401	133
226 402	133
226 403	133
227 239	133
227 245	133
236 301	141
236 302	76
247 661	132
255 851	134
258 252	133
258 253	133
323 571	106, 131
323 571	136
329 708	233
331 713	133
331 714	133
335 415	141
035 415	164
342 046	138
342 047	138
350 362	132
350 363	132
350 364	132
350 366	132
350 367	132
350 411	147
350 412	147
357 258	174
357 281	175
357 282	174
357 283	176
374 038	141
376 931	133
376 932	133
376 934	133
376 935	133
376 936	133

preuare

Documents Provided by Coast Pneumatics

ORDER ONLINE

ORDER ONLINE

Index
Numerical

Order no.	Page
376 937	133
376 938	133
376 939	133
376 940	50, 133
376 941	50, 133
377 305	51
378 542	57
378 543	57
380 284	147
385 936	139
395 128	51
395 502	51
395 503	51
525 257	135
525 258	145
525 276	192
525 714	134
525 716	134
525 717	134
525 722	182, 230
525 723	240
525 724	182
025 927	51
525 927	52
525 951	142
525 952	143
525 953	143
525 954	143
525 955	143
525 963	145
525 964	144
526 092	202
526 095	210
526 259	184
526 260	184
526 337	52, 137
526 501	255
526 502	255
526 503	255
526 504	256
526 505	256
526 506	256
526 507	256
526 508	256
526 510	256
526 511	256
526 512	256
526 513	256
526 514	256
526 584	247
526 585	241
526 588	241
526 715	52, 134
526 814	134
526 847	177

Order no.	Page
527 513	70, 233
529 133	229
529 134	229
529 379	188
529 380	188
529 381	188
529 382	188
529 383	188
529 384	188
529 385	188
529 386	188
529 387	183
529 388	183
529 389	183
529 390	183
529 391	183
529 392	183
529 393	183
529 394	183
529 674	188
529 675	188
529 938	220
529 939	220
531 141	196
531 142	196
531 143	196
532 200	14
532 670	188
532 671	188
532 672	188
532 673	188
532 676	188
532 677	188
532 678	188
532 679	188
532 680	188
532 681	188
532 682	188
532 683	188
532 684	188
532 685	188
648 607	52
12 060 013	201
12 060 034	211
12 065 053	242
12 065 054	242
12 065 055	243
12 065 056	243

preview

Documents Provided by Coast Pneumatics
ORDER ONLINE